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**RCRA FACILITY INVESTIGATION PROPOSAL
CIBA-GEIGY FACILITY
CRANSTON, RHODE ISLAND**

**VOLUME 4 OF 6
HEALTH AND SAFETY GUIDELINES**

Submitted by:

**CIBA-GEIGY CORPORATION
444 SAWMILL RIVER ROAD
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Date:

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SEMS DocID

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SECTION 1 INTRODUCTION

The Health and Safety Guidelines (Guidelines) presented herein establish protocol for the safety of personnel during field activities associated with the RCRA Facility Investigation (Facility Investigation) of the CIBA-GEIGY facility in Cranston, Rhode Island. The Guidelines are designed for an investigation of soil, ground water, sediment and surface water. Work activities addressed by the Guidelines are discussed in Section 3. Based on the nature of the work to be performed, the USEPA, in consultation with CIBA-GEIGY, will determine which contractors are required to prepare a Health and Safety Plan. Based on the non-intrusive and non-exploratory nature of certain work (e.g. surveying), some contractors may not be required to prepare a Health and Safety Plan (Plan).

Woodward-Clyde Consultants (WCC) of Wayne, New Jersey, will be responsible for monitoring health and safety compliance. WCC personnel will follow the Guidelines presented herein. Each contractor will be responsible for the health and safety of the contractor personnel. Contractors are encouraged to follow the protocol in these Health and Safety Guidelines and they may use them in preparing their Health and Safety Plans. Some sections of these Guidelines may be appropriate, as written, for inclusion in the contractors Plans. Site protocol must be in accordance with applicable State and Federal requirements including appropriate provisions of OSHA Regulations (29 CFR Part 1910).

The Health and Safety Guidelines provided herein are based on a review of available information and an evaluation of potential hazards. Because of the variety of possible work activities and site conditions which may be encountered, and the uncertainties associated with potential health effects from exposures to various constituents which may be present, no guarantees can be made regarding the potential for health effects associated with field activities at the facility.

The Guidelines describe health and safety procedures and equipment appropriate for reducing the potential for exposure of field investigative personnel. The Guidelines may be modified in response to additional information obtained regarding potential hazards to field personnel.

Contractors are solely responsible for providing their employees with appropriate personal protection equipment. Woodward-Clyde Consultants will monitor air quality as per these Health and Safety Guidelines. Contractors are encouraged to independently monitor air quality. In the event that contractors do not have the appropriate air monitoring equipment or otherwise choose not to monitor air quality, WCC personnel will inform the contractors' Site Safety Officer(s) of readings measured by WCC. The contractor is solely responsible for actions taken by contractor personnel based on the readings.

1.1 FACILITY HISTORY

The CIBA-GEIGY facility is located along the north and south banks of the Pawtuxet River in Cranston and Warwick, Rhode Island. The defined area of the facility is about 31 acres, 13 acres north of the Pawtuxet River in Cranston, and 18 acres south of the river in Warwick. Figure 1-1 shows the location of the facility.

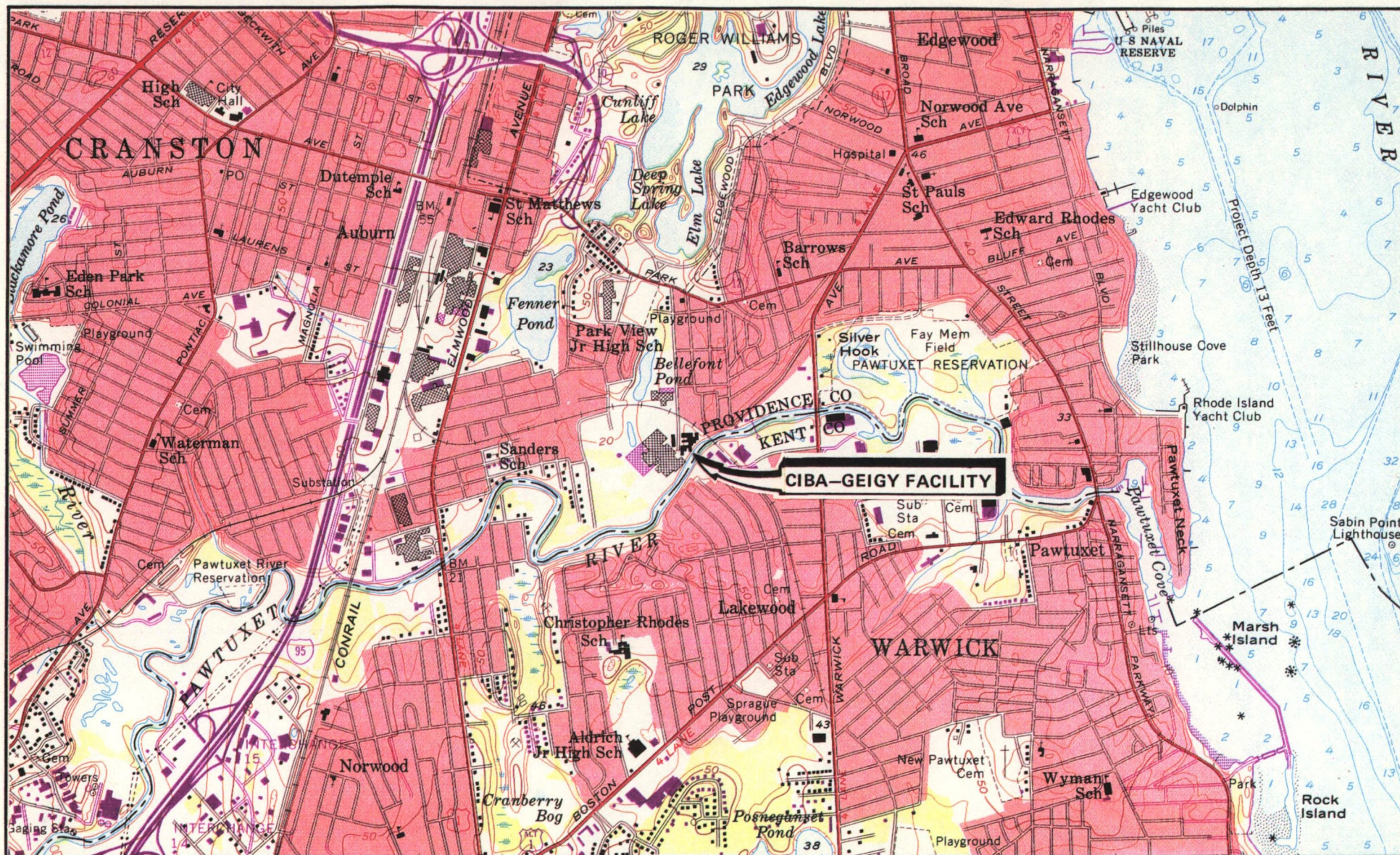
Industrial activity at the facility occurred from 1930 to 1986. During that period, a vast array of products were manufactured. Major products included tanning agents, agricultural products, plastics additives, optical brighteners and pharmaceuticals.

During 1986 and 1987 the facility was decommissioned and production related operations were razed. The facility currently consists of open leveled areas, most of which are paved, two buildings (a laboratory and warehouse) and a wooded area.

The United States Environmental Protection Agency (USEPA) has identified

12 Solid Waste Management Units (SWMUs) and two Areas of Concern. The USEPA defines a SWMU as any unit which contained solid or hazardous wastes from which hazardous wastes or hazardous constituents could have potentially migrated. SWMUs include media (e.g., soil) which are known to or suspected of containing hazardous constituents that could have potentially migrated. An Area of Concern is an area of which releases of hazardous waste or hazardous constituents have been identified. CIBA-GEIGY has identified two Additional Areas of Investigation. Figure 1-2 shows the locations of SWMUs, Areas of Concern and Additional Areas of Investigation, and the media to be investigated.

During 1987, the USEPA collected and analyzed soil, sediment and ground water samples in support of the identification of SWMUs and Areas of Concern. The samples were collected during the RCRA Facility Assessment (Facility Assessment). CIBA-GEIGY conducted a Preliminary RCRA Facility Investigation (Preliminary Investigation) during 1988. The Preliminary Investigation included soil and ground water sampling and analysis. A summary of the Facility Assessment and Preliminary Investigation is presented in Volume 2 - Current Assessment Summary Report. The potential chemical hazards assessed in Section 4 are based on the analytical results of the Facility Assessment and Preliminary Investigation.



BASE MAP SOURCE:

USGS 7.5 MINUTE PROVIDENCE,
RI QUADRANGLE, PHOTOREVISED
1970, 1975.

0 2000 4000 FT
SCALE

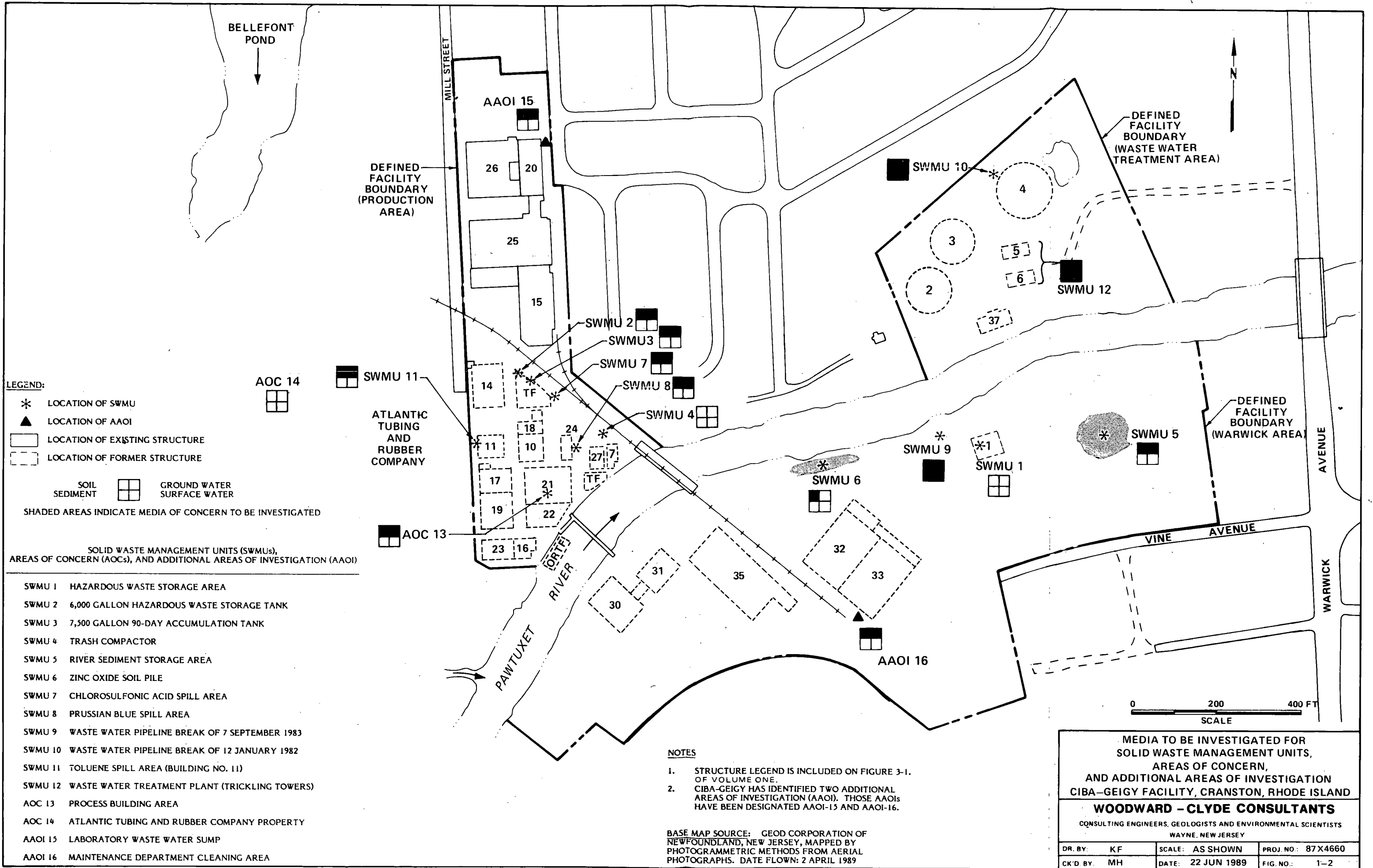


**FACILITY LOCATION MAP
CIBA-GEIGY FACILITY
CRANSTON, RHODE ISLAND**

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
WAYNE, NEW JERSEY

DR. BY: RTL	SCALE: AS SHOWN	PROJ. NO.: 87X4660
CK'D. BY: TGC	DATE: 5 FEB 1988	FIG. NO.: 1-1



SECTION 2 KEY PERSONNEL

Contractors that prepare a Plan must identify key personnel in accordance with the following descriptions.

2.1 PROJECT MANAGER (Contractor Designee)

The Project Manager must have the following responsibilities:

- o To see that the project is performed in a manner consistent with the Health and Safety Plan.
- o To have a Plan prepared.
- o To approve the Plan.
- o To provide the Health and Safety Officer (defined below) with project information related to health and safety matters and development of the Plan.
- o To implement the Plan.
- o To monitor compliance with the Plan.

The Project Manager must have the authority to take the following actions:

- o To determine personnel assignments on this project.
- o To temporarily suspend field activities, if the health and safety of personnel are endangered, pending further consideration by the Health and Safety Officer.

- o To temporarily suspend an individual from field activities for infractions of the Plan, pending further consideration by the Health and Safety Officer.

2.2 HEALTH AND SAFETY OFFICER: (Contractor Designee)

The Health and Safety Officer (HSO) must have the following responsibilities:

- o To interface with the Project Manager in matters of health and safety.
- o To develop a Plan for the project.
- o To monitor compliance with the approved Plan.
- o To assist the Project Manager in seeing that proper health and safety equipment is available for the project.
- o To approve the Plan.
- o To approve personnel to work on this site with regard to medical examinations and health and safety training.

The HSO must have the authority to take the following actions:

- o To suspend work or otherwise limit exposures to personnel if the Plan appears to be unsuitable or inadequate.
- o To direct workers to change work practices if they are deemed to be hazardous to the health and safety of personnel.

- o To remove personnel from the project if their actions or conditions endanger their health and safety or the health and safety of co-workers.

2.3 SITE SAFETY OFFICER: (Contractor Designee)

The Site Safety Officer (SSO) must have the following responsibilities:

- o To direct health and safety activities on-site.
- o To report safety-related incidents or accidents to the Project Manager and HSO.
- o To assist the Project Manager in implementing the Plan.
- o To maintain health and safety equipment on-site, as specified in the Plan.
- o To inspect health and safety activities on-site, as specified in the Plan, and report results to the Project Manager and HSO.

The SSO must have the authority to take the following actions:

- o To temporarily suspend field activities, if health and safety of personnel are endangered, pending further consideration by the HSO.
- o To temporarily suspend an individual from field activities for infractions of the Plan, pending further consideration by the HSO.
- o To designate a temporary SSO in his/her absence.

SECTION 3

WORK ACTIVITIES

The work activities which may be performed under the respective Health and Safety Plans must be identified by the respective contractors based on their scope of services. Work activities currently planned include the following:

- o excavate test pits;
- o drill boreholes;
- o install monitoring wells;
- o inspect the excavation of test pits;
- o inspect the drilling of test borings with split-spoon sampling;
- o inspect the installation of ground water monitoring wells in completed boreholes;
- o inspect development of and/or develop ground water monitoring wells;
- o purge and sample new and existing ground water monitoring wells;
- o collect surficial soil samples;
- o perform a bathymetric survey of the Pawtuxet River;
- o measure the water discharge of the Pawtuxet River;
- o collect surface water and sediment samples in the Pawtuxet River;

- o perform measurements of water levels in monitoring wells and the Pawtuxet River;
- o perform aquifer tests; and
- o survey locations of test borings, monitoring wells and other sampling locations.

The Plan must state that other possible work activities not described may only be conducted after approval of an appropriate addendum to the Plan.

The Plan must include a termination date after which the Plan must be reviewed and modified if necessary by the Health and Safety Officer.

SECTION 4 HAZARD ASSESSMENT

An assessment of the hazards has been made based on the activities contemplated for the Facility Investigation. Contractors may identify additional potential hazards based on the scope of their services. The following potential hazards have been identified:

- o skin and eye contact with constituents of concern;
- o ingestion of constituents of concern; and
- o inhalation of vapors or dusts;
- o physical hazards associated with the use of drilling, excavating, sampling, and support equipment;
- o heat stress (depending on season work is to be performed);
- o cold stress (depending on season work is to be performed);
- o biological hazards such as mosquitos, ticks, and snakes; and
- o flammable hazards.

The following paragraphs describe the potential hazards associated with field activities at the facility.

4.1 CHEMICAL HAZARDS

The chemical hazard assessment forms the foundation for these Guidelines. The assessment is based on the constituents of concern identified in environmental media samples that were collected and analyzed during the Facility Assessment and Preliminary Investigation. The constituents identified were reviewed in order to produce a refined list of constituents that may pose a potential hazard. Tables 4-1, 4-2 and 4-3 summarize the constituents of concern that have been identified for this chemical hazard assessment.

A site history study was also conducted to identify materials that potentially may be present because of their past use at the facility or that have been identified by others to ensure that site activities, personnel protection, and emergency response procedures are appropriate for the specific constituents of concern expected to be encountered. Those constituents of concern are consistent with the results of the Facility Assessment and the Preliminary Investigation.

Table 4-4 presents a summary of the published Threshold Limit Values for the constituents of concern identified for the chemical hazard assessment. Available emergency response/toxicologic information from the Handbook of Industrial Toxicology (1987) for those identified constituents of concern are included in Appendix A.

The primary exposure pathways of concern for those constituents are inhalation and skin absorption. Exposure via vapors and dust may occur. However, the expected concentrations of volatile compounds present generally do not provide significant concentrations in the breathing zone in non-confined environments. The remainder of the constituents are relatively non-volatile and the major concern with them is exposure via dust.

Ingestion of constituents of concern must be controlled on-site by prohibiting eating and smoking in the Exclusion Zone (see Section 8) and by requiring all field

personnel to decontaminate themselves upon leaving the Exclusion Zone. Drinking of liquids must take place only after partial decontamination has taken place (except in a heat stress emergency situation). If necessary, drink breaks must be scheduled at least every two hours to avoid heat stress problems.

Skin and eye contact with some of the constituents at the site may cause skin or mucous membrane irritation. Many of those constituents can be absorbed into the bloodstream through the skin or eyes.

Any body area which comes in contact with contaminated materials must be washed with soap and rinsed immediately. All field personnel must report any skin or eye contact symptoms to the SSO. The person must be treated by a physician and steps must be taken to eliminate similar exposures. An emergency eye wash station must be present at the Decontamination Area.

Potential hazards must be reduced by protecting against exposures to hazardous materials via utilization of appropriate personal protective equipment (PPE). PPE to protect the body against contact with known or anticipated chemical hazards has been divided into five levels of protection categories (Level A, B, C, Modified D, and D) according to the degree of protection afforded. Levels D, Modified D and C are discussed in Section 7.

The levels of protection anticipated to be used during performance of site activities are Level D and Modified Level D. If conditions are encountered which require Level B or Level A protection then field activities must be suspended until the Health and Safety Plan(s) are modified.

Initial and periodic air monitoring must be employed to assess respiratory hazards in the work zones for work activities as appropriate. Although the use of respiratory protective equipment is not anticipated, full-face respirators with appropriate cartridges must be available in case respiratory hazards are deemed to be present based on air monitoring results.

If they are not appropriate, then levels of protection must be changed by the SSO with approval by the HSO.

4.2 PHYSICAL HAZARDS, HEAT STRESS AND COLD EXPOSURE

There is a risk of physical injury resulting from contact with heavy equipment. Field personnel should be aware of the presence of these hazards and take steps to avoid them. Attachment A presents Safety Guidelines for Drilling. Attachment B presents Safety Guidelines for Test Excavations.

Use of steel toed and steel shank work boots and hard hats (if overhead hazards exist) must be required while in the work zone at the discretion of the SSO. Personnel should be cognizant of the fact that when PPE such as respirators, gloves, and protective clothing are worn, visibility, hearing, and manual dexterity are impaired.

In addition, the PPE required for some activities (coveralls and respirators) places a physical strain on the wearer. The Heat Stress Prevention Guidelines presented in Attachment C should be followed to deal with this health hazard if warm weather occurs. Those guidelines describe heat stress identification, treatment, prevention and monitoring. Fluids must be provided at regular intervals during the work periods in order to maintain adequate body fluid levels for the field personnel. Attachment D presents the Cold Exposure Prevention Guidelines.

4.3 BIOLOGICAL HAZARDS

Numerous types of pest organisms may be present, including mosquitos, snakes and ticks. Mosquitos may be prevalent at the site. Field personnel should use insect repellants before donning PPE. To avoid snake bites, personnel should check for snakes before walking through grassy or debris strewn areas. A first aid kit and insect repellent must be available for use in the field. In many parts of

the northeast United States, tick-borne diseases pose a significant health risk during warm months. Attachment E presents a discussion of Ticks and Tick-Borne Diseases.

4.4 FLAMMABLE, EXPLOSIVE AND REACTIVE HAZARDS

Flammable, explosive and reactive hazards are not expected to be encountered during the course of this project. However, as a precaution, air monitoring must be conducted during all activities to evaluate the potential for explosion.

TABLE 4-1
RFA: SUMMARY OF CONSTITUENTS OF CONCERN IDENTIFIED
FOR THE CHEMICAL HAZARD ASSESSMENT
CIBA-GEIGY FACILITY
CRANSTON, RHODE ISLAND

Chemical	<u>Maximum Concentrations Observed</u>		
	Soils (ppm)	Ground Water (ppb)	Sediments (ppm)
METALS			
Antimony	137	NA	NA
Arsenic	NA	609	NA
Barium	622	242	NA
Chromium	NA	21	NA
Iron	64,500	NA	19,200
Lead	NA	178	NA
Manganese	971	5,470	NA
Magnesium	5,760	NA	2,820
Vanadium	101	NA	NA
Zinc	11,100	25,520	2,280
VOLATILE ORGANICS			
Acetone	0.13	240	NA
Total Xylene	NA	2,923	NA
Chlorobenzene	NA	1,800	NA
Ethylbenzene	NA	778	NA
1,2-Dichloroethylene	NA	210	NA
Methylene Chloride	0.05	NA	NA
Toluene	0.008	NA	NA

TABLE 4-1 (continued)
RFA: SUMMARY OF CONSTITUENTS OF CONCERN IDENTIFIED
FOR THE CHEMICAL HAZARD ASSESSMENT
CIBA-GEIGY FACILITY
CRANSTON, RHODE ISLAND

Chemical	<u>Maximum Concentrations Observed</u>		
	Soils (ppm)	Ground Water (ppb)	Sediments (ppm)
SEMI-VOLATILE ORGANICS			
Fluoranthene	6.1	NA	17.0
Pyrene	2.4	NA	6.5
Butylbenzylphthalate	22	NA	NA
Chrysene	3.7	NA	NA
Phenanthrene	4.2	NA	7.7
Dimethylphthalate	1.4	NA	NA
1,2-Dichlorobenzene	NA	230	NA
Phenol	NA	2,400	NA
4-Chloroaniline	NA	130	NA
Bis (2-ethylhexyl)phthalate	NA	NA	19.0
Di-N-octylphthalate	NA	NA	6.4
Benzo(k)fluoranthene	NA	NA	3.1

NOTES

ppm = parts per million

ppb = parts per billion (ug/l)

NA = not applicable

TABLE 4-2
PRFI: SUMMARY OF SOIL CONSTITUENTS OF CONCERN
IDENTIFIED FOR THE CHEMICAL HAZARD ASSESSMENT
CIBA-GEIGY FACILITY
CRANSTON, RHODE ISLAND

	<u>Maximum Concentration Observed (ppm)</u>
<u>Metals</u>	
Arsenic	8.2
Barium	606
Cadmium	11
Chromium	456
Copper	221
Lead	383
Zinc	24,600
Cyanide	23.9
<u>Volatile Organics</u>	
Acetone	2.9
Chlorobenzene	33
Ethyl Benzene	3.6
Xylene	19
<u>Semi-Volatile Compounds</u>	
Total Polyaromatic Hydrocarbons (PAHs)	34.4

NOTES:

ppm = parts per million

TABLE 4-3
PRFI: SUMMARY OF GROUND WATER CONSTITUENTS OF CONCERN
IDENTIFIED FOR THE CHEMICAL HAZARD ASSESSMENT
CIBA-GEIGY FACILITY
CRANSTON, RHODE ISLAND

	<u>Maximum Concentration Observed (ppb)</u>
<u>Metals</u>	
Barium	1050
Chromium	62.4
Lead	192
Nickel	47.3
<u>Volatile Organics</u>	
Chlorobenzene	33,000
Methylene Chloride	10,000
1,1,1 Trichloroethane	470
Ethylbenzene	2,600
Toluene	39,000
Xylene	7,200
Chloromethyl Benzene Isomer	2,400 T
<u>Semi-Volatile Compounds</u>	
2-Chlorophenol	98
1,2-Dichlorobenzene	280
2-Methylphenol	380
4-Methylphenol	210
Naphthalene	200
Dimethyl Benzene Isomer	2,080 T

NOTE:

T = tentatively identified compound
ppb = parts per billion

TABLE 4-4
SUMMARY OF PUBLISHED THRESHOLD LIMIT VALUES FOR IDENTIFIED CONSTITUENTS OF CONCERN
CIBA-GEIGY FACILITY, CRANSTON, RHODE ISLAND

Chemical	TWA (ppm)	STEL (ppm)	Comments
Acetone	750	1,000	
Chlorobenzene	75	NE	
Ethylbenzene	100	125	
Total Xylenes	100	150	
1,2-Dichloroethylene	200	NE	
Methylene Chloride	50	NE	Suspected Human Carcinogen
Toluene	100	150	
Chrysene	NE	NE	Suspected Human Carcinogen
Dimethylphthalate	5 mg/m ³	NE	
Dichlorobenzene	50 (ceiling limit)	NE	
Phenol-skin protection	5	NE	
Bis (2-ethylhexyl)phthalate	5 mg/m ³	10 mg/m ³	Suspected Human Carcinogen
Antimony and Compounds	0.5 mg/m ³	NE	
Arsenic and Soluble Compounds	0.2 mg/m ³	NE	
Barium and Soluble Compounds	0.5 mg/m ³	NE	
Chromium, Metal	0.5 mg/m ³	NE	
Lead, Inorganic Dusts and Fumes	0.15 mg/m ³	NE	
Manganese, Dust and Compounds	5 mg/m ³	NE	
Vanadium, Respirable Dust and Fumes	0.05 mg/m ³	NE	

NE = Not Established by ACGIH TWA= Time Weighted Average STEL = Short Term Exposure Limit

Reference: Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists (ACGIH).

SECTION 5

GENERAL HEALTH AND SAFETY REQUIREMENTS

The following general health and safety requirements are applicable to each contractor required to prepare a Plan. Contractors must follow the requirements and they are encouraged to include them in their Plans.

5.1 MEDICAL EXAMINATION

Before commencing any field activities all personnel must take or must have taken an annual medical examination as part of a medical surveillance program. The medical surveillance program must meet the OSHA requirements of 29 CFR 1910.120(f).

5.2 TRAINING

All field personnel must be thoroughly trained as specified by OSHA in 29 CFR 1910.120(e). Training includes attendance of an initial 40-hour basic health and safety training course off the site, a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor, and on-site, site-specific training. Site-specific training must be performed by the HSO and/or the SSO.

5.3 INCIDENT REPORTING

Any incident or accident involving field personnel requires that a Hazardous Waste Incident Report be filed. Situations covered by this policy include, but are not limited to, fires, explosions, illnesses, injuries, and automobile accidents. Reports must be sent to the HSO within 24 hours of the incident/accident. Worker's Compensation Insurance reports should be filed with the individual's employer within 48 hours of each accident or illness which results from work

related activities and requires medical attention. See Attachment F for an example of the incident report form. The SSO must complete this form in case of an accident or incident.

5.4 ILLUMINATION AND SANITATION

If practical, all major work tasks must occur during daylight hours. The illumination requirements set forth by OSHA in 29 CFR 1910.120 (m) will be met.

The sanitation requirements regarding potable and non-potable waters, toilet facilities and washing facilities must be followed as set forth in 29 CFR 1910.120(n). Temporary sleeping quarters requirements are not applicable to this site.

5.5 COMPLIANCE AGREEMENT

The SSO must hold meetings with field personnel before work commences. During the meetings, all personnel must be provided with a copy of the Plan; the Plan must be reviewed and discussed and questions answered; fit testing and care of respirators must be reviewed. Signed Compliance Agreement Forms (see Section 14) must be collected by the SSO and filed. Individuals refusing to sign the form must be prohibited from working on the site.

5.6 RESPIRATOR MAINTENANCE

Respirators (MSA Ultra twin or equivalent) must be cleaned daily according to procedures prescribed by the manufacturer. Appropriate cartridges must be used and replaced either daily or if breakthrough is detected at any time while in use. Negative and positive pressure tests must be performed daily on each individual respirator. The following checks must be performed on a daily basis in addition to the above:

- o Exhalation valve - pull off plastic cover and check valve for debris or for tears in the neoprene valve (which could cause leakage).
- o Inhalation valves (two) - screw off cartridges and visually inspect neoprene valves for tears. Make sure that the inhalation valves and cartridge receptacle gaskets are in place.
- o Make sure a protective lens cover is attached to the lens. Lenses are expensive to replace and must be protected at all times.
- o Make sure you have the right cartridge.
- o Make sure that the face piece harness is not damaged. The serrated portion of the harness can fragment which will prevent proper face seal adjustment.
- o Make sure the speaking diaphragm retainer ring is hand tight.

5.7 PROJECT MANAGER NOTIFICATION

All field personnel must inform the SSO or his/her designee before entering the site.

If any drums or other previously unidentified potential hazards are discovered during field work, personnel must leave the area of concern immediately and call the Project Manager for further instructions.

5.8 PROJECT SAFETY LOG

A project safety log must be used to record entry and exit dates and times of all personnel and of project site visitors; accidents, injuries, and illnesses; incidences of safety infractions by field personnel; air quality and personal

exposure monitoring data; and other information related to safety matters. All accidents, illnesses, or other incidences will be reported to the Project Manager and to the HSO.

5.9 OSHA INFORMATION POSTER

In accordance with the Occupational Safety and Health Act of 1970, a copy of the OSHA information poster must be present on all sites. A copy of that poster is appended as Attachment G. It should be posted on sites with trailers or permanent buildings.

5.10 PROHIBITIONS

- o Smoking, eating, drinking, chewing tobacco or toothpicks, application of cosmetics, storing food or food containers, or having open fires must not be permitted in work zones. Good personal hygiene must be practiced by field personnel to avoid ingestion of contaminants.
- o Approach or entry into areas or confined spaces where toxic or explosive concentrations of gases or dusts may exist without proper equipment must be prohibited.

5.11 WORK PROCEDURES

Whenever possible, field personnel must work from a position upwind of work activities.

All operations conducted on the Pawtuxet River including the bathymetric survey and surface water and sediment sampling, must be performed with a dedicated "watcher" on-shore. All personnel must wear U.S. Coast Guard approved flotation jackets while on the boat and suitable slip resistant footwear.

5.12 UNDERGROUND STRUCTURES

Extreme caution must be exercised whenever the possibility of encountering buried utilities, tanks, etc exists. Prior to commencement of intrusive activities, all available sources of information such as site utility drawings, public utility drawings, and construction drawings must be reviewed. If underground obstructions are unexpectedly encountered, the area must be excavated using manual equipment until the nature of the obstruction is discerned.

5.13 SITE SAFETY MEETINGS

During field operations, an initial site orientation meeting and daily safety meetings must be held by the SSO to review and plan specific health and safety aspects of scheduled work. Potential subjects to be discussed are presented below:

1. Preliminary

- o Medical clearances for all participants.
- o Written Health and Safety Plan availability (copies provided to all participants).
- o Personal protective equipment and decontamination equipment availability for checkout, demonstration and fit testing (if necessary).

2. Training topics

- o Delineation of on-site personnel responsibilities.

- o Review of the Plan including:
 - types of hazards;
 - pathways of exposure;
 - levels of protection;
 - contamination avoidance;
 - confined space entry;
 - physical hazards;
 - decontamination;
 - emergency procedures; and,
 - specific on-site area/work tasks of concern.
- o Decontamination review including:
 - delineation of work zones; and,
 - set-up and dry run of decontamination equipment.
- o Personnel protective clothing - use and dress out procedures.
- o Monitoring equipment review.
- o Questions and answers.
- o Signing and completion of the Plan Compliance Agreement Form.

SECTION 6

AIR QUALITY MONITORING

During field activities at the site, an air quality survey must be performed and results must be recorded in the Project Safety Log. One or more of several instruments, as discussed below, may be utilized to monitor air quality in the work zones:

- o Combustible Gas Indicator/Oxygen Meter

A Combustible Gas Indicator/Oxygen Meter (CGI) may be used at the discretion of the SSO or his/her designee to measure the concentration of flammable vapors and gases, oxygen, and hydrogen sulfide (H_2S) in the air during drilling activities. Flammable gas concentrations are measured as percentages of the Lower Explosion Limit (LEL). Oxygen content is measured as a percentage of total air. Hydrogen sulfide concentration is measured in parts per million.

- o HNU Photoionization Detector

The HNU Photoionization Detector (HNU PID) or equivalent must be used to detect trace concentrations of certain organic vapors and a few inorganic gases in the air. Methane, ethane, and the major components of air are not detected by the HNU PID. Based on the Hazard Assessment the recommended HNU PID probe selected is the 10.2 eV due to its specificity for the group of constituents of concern at the site. It should be kept in mind that the HNU PID detects mixtures of compounds simultaneously, and readings do not indicate concentrations of any individual compound when a mixture of compounds are present.

The HNU PID must be calibrated daily using a 50 ppm benzene standard for calibration. Calibrations must be documented in the Project Safety Log. HNU PID readings will be checked in the breathing zone of the most potentially exposed worker or workers.

- o Multigas Detector Tubes

Multigas Detector Tubes, such as Draeger Tubes, may be used to detect and quantify the concentration of contaminants in the air. The tubes to be employed must be sensitive in appropriate concentration ranges. It should be realized that most "compound specific" detector tubes also detect interference from other hydrocarbons; readings do not differentiate between which compounds are present.

The tube readings should be compared to appropriate threshold limit values to determine what level of protection is required. If elevated HNU PID readings compared to background continue to occur or phase product or odorous material is noted in the boreholes, detector tubes should be employed.

6.1 RESPONSE LEVELS

Response levels must be established to address a range of air quality condition that could potentially be encountered during field work. The HSO must be notified as soon as possible if air quality conditions require upgrading PPE. If conditions are encountered which require Level B or Level A protection, then field activities must be suspended until the Plan(s) are modified.

Based on the Hazard Assessment (Section 4) and general health and safety criteria, the following response levels are recommended for the Facility Investigation:

Air Quality Measurement

Response

HNU PID reading less than 3 ppm
above background (1 min. average)

CGI reading less than 25% LEL

Oxygen reading greater than 19.5%
and less than 21%

Hydrogen sulfide reading less than 5 ppm

No dusts visible in breathing zone

Level D Protection (Modified Level
D Protection at discretion of SSO)

HNU PID reading 3 ppm to 10 ppm
above background (1 min average)

Dusts visible in breathing zone

Level C Protection

HNU PID reading greater than 10 ppm
above background

Oxygen reading less than 19.5%
or greater than 21%

Hydrogen sulfide reading greater
than 5 ppm

Suspend all work in areas where
readings above 10 ppm obtained;
notify HSO and Project Manager
as soon as possible. Air
monitoring must be conducted
periodically to determine if work may
continue or if modifications to the
Plan(s) are warranted. Take action to
suppress emissions as appropriate.

CGI reading greater than 25% LEL

All ignition sources must be shut off.
The work zones must be excavated
immediately. Work must not resume
until the CGI readings are
continuously below 25% LEL for 15
minutes or more. Call HSO as soon
as possible.

SECTION 7

PERSONAL PROTECTION EQUIPMENT

The personal protection equipment specified below must be provided to all field personnel by each contractor required to prepare a Health and Safety Plan. The following requirements are in accordance with OSHA regulations:

- o facial hair that interferes with proper fit of respirators must not be worn;
- o contact lenses must not be worn; and,
- o eyeglasses that interfere with proper fit to full-face respirators must not be worn.

Level D Personal Protective Equipment

- Hard hat (if overhead hazard exists)
- Safety glasses or goggles (if splash or dust hazard exists)
- Steel toed and steel shank work boots⁽¹⁾
- Nitrile - butadiene rubber outer gloves⁽¹⁾
- Latex surgical gloves (to be worn underneath outer gloves)⁽¹⁾
- Regular Tyvek coveralls⁽¹⁾

(1) Optional, at discretion of SSO or his/her designee.

Modified Level D Personal Protective Equipment

- Hard hat (if overhead hazard exists)
- Safety glasses or goggles (if splash or dust hazard exists)
- Steel toed and steel shank work boots⁽¹⁾

- Nitrile-butadiene rubber outer gloves
- Latex surgical gloves (to be worn underneath outer gloves)
- Saranex impregnated Tyvek coveralls (taped at cuffs)
- Rubber overboots or disposable "booties"

(1) Optional, at discretion of SSO or his/her designee.

Level C Personal Protective Equipment

- Hard hat (if overhead hazard exists)
- Full-face MSA respirator (or equivalent) with appropriate cartridges
- Steel toed and steel shank work boots⁽¹⁾
- Nitrile - butadiene rubber outer gloves
- Latex surgical gloves (to be worn underneath outer gloves)
- Rubber overboots or disposable "booties"
- Saranex impregnated Tyvek coveralls (taped at cuffs)

(1) Optional, at discretion of SSO or his/her designee.

In addition to those items, all air monitoring equipment described previously must be provided. A first aid kit, fire extinguishers, eye wash station, appropriate barricades and alarm horn must be installed and maintained on-site. Bottled drinking water, a telephone, and electrical service must be available in the trailer.

Should work at the site be conducted using respiratory protection (i.e., Level C PPE), the need for a personal exposure monitoring program must be evaluated by the HSO. Any such monitoring equipment must be specified in a Health and Safety Plan Addendum.

A list of personal protective equipment is included as Attachment H.

SECTION 8

WORK ZONES

To minimize the movement of contaminants from the site to uncontaminated areas, work zone areas must be set up. The work zones must include the following:

- Zone 1: Exclusion Zone
- Zone 2: Decontamination Zone
- Zone 3: Support Zone

The Exclusion Zone is the zone where contamination does or could occur. All persons entering this zone must wear appropriate Personal Protective Equipment.

Between the Exclusion Zone and Support Zone is the Decontamination Zone which provides a transition zone between potentially contaminated and clean areas of the site. This zone must be located directly outside of the Exclusion Zone. All personnel must decontaminate when leaving the Exclusion Zone. Work zones may not be necessary for most Level D activities. The SSO or his/her designee must determine the need for work zones during those activities.

SECTION 9

PERSONAL DECONTAMINATION PROCEDURES

The following steps must be taken, at a minimum, for personnel decontamination when leaving the Exclusion Zone (subject to modification by SSO):

- o Deposit equipment that needs to be decontaminated on plastic drop cloths.
- o Wash boots and outer gloves with long handled brushes in wash tub containing detergent and water.
- o Rinse boots and outer gloves with long handled brush in a wash tub containing clean water or use a sprayer to rinse off boots and gloves.
- o Remove tape and place in disposal drum.
- o Remove outer gloves and place in disposal drum.
- o Remove suit and place in disposal drum.
- o Remove respirator and place on table to be decontaminated.
- o Remove inner gloves and place in disposal drum.
- o Wash hands and face.

Used disposable clothing must be bagged for curbside garbage pickup.

SECTION 10

EMERGENCY RESPONSE

The purpose of this section is to recommend emergency response procedures. The types of potential emergencies that are addressed include:

- o Fire;
- o Chemical exposures to site personnel; and,
- o Physical injuries to site personnel.

Releases of chemicals to the environment which would impact the general public, property, or the environment are not anticipated during this project because the work will take place in areas which contain relatively low levels of constituents of concern.

10.1 EMERGENCY RECOGNITION AND PREVENTION

10.1.1 Fires

Fires are possible whenever flammable gases or vapors are present in proper concentrations and an ignition source is present. Construction equipment itself may provide an ignition source. To prevent fires, a CGI may be used to detect flammable concentrations of gases or vapors. Ignition sources (including construction equipment) must be turned off and the area evacuated if vapors or gases reach 25% of the LEL (lower explosive limit). Work must not resume until the SSO observes CGI flammable gas concentrations continuously below 25% of the LEL for 15 minutes or more.

10.1.2 Chemical Exposures

Work must be performed in such a manner that exposure to contaminants through skin or eye contact, inhalation or ingestion is minimized. Work practices that must be followed to reduce chemical exposures include:

- PPE, for the appropriate work activities and areas as defined by the SSO, must be used by all personnel. A formal revision to the Plan must be made by the HSO in order to modify PPE specifications.
- Keep hands away from face during work activities.
- Minimize all skin and eye contact with contaminants.

Early recognition of chemical exposure symptoms is essential to the prevention of serious chemical exposure incidents. Symptoms of exposure to the type of compounds potentially present at the site include the following: fatigue, weakness; eye, nose, throat irritation; headache; dizziness; nausea; vomiting; malaise; tremors; aggressive confusion; cyanosis (blue color to skin); anemia; and muscle spasms.

If a person experiences any of these symptoms, or others, or recognizes any of the symptoms in a fellow worker, the person experiencing the symptoms must stop work and report his or her symptoms to the SSO. If the symptoms persist or appear to be damaging in any way, the SSO must make arrangements to take the individual to a hospital for medical treatment. If symptoms are serious, work activities in the area where the person was exposed must be discontinued until more is known about the incident. Incident reporting procedures must be initiated.

10.1.3 Physical Injury

Site personnel should constantly look for potential safety hazards such as holes or ditches; precariously positioned objects, such as drums or equipment that may fall; sharp objects, such as nails, metal shards, and broken glass; protruding objects at eye or head level; slippery surfaces; steep grades; uneven terrain or unstable surfaces, such as walls that may cave in or flooring that may give way. Site personnel should inform the SSO of any potential hazards identified so that corrective mitigative action can be taken.

10.2 EMERGENCY ALERTING PROCEDURES

The SSO must alert the appropriate work groups when and if an emergency occurs relating to the site investigation activities through the use of radios or by directly contacting the work group. The SSO and any isolated work group must carry radios if reasonable contact cannot be maintained. If radios fail, a single blast from an alarm horn (or equivalent) must be used to signal workers to stop work and assemble in the Decontamination Zone.

10.3 EVACUATION PROCEDURES

Normally, personnel should evacuate through the Decontamination Zone. If a fire blocks entry into the Decontamination Zone, personnel should proceed directly to the nearest site gate. Evacuation should proceed in an upwind direction from the emergency if possible.

10.4 EMERGENCY TELEPHONE NUMBERS

The telephone numbers of emergency services are given below (also see Attachment I). A map of the route to the nearest hospital is presented in Figure 10-1.

<u>Emergency Service</u>	<u>Telephone Number</u>
Ambulance	(401) 781-9200
Cranston Fire Department	(401) 461-5000
Cranston Police Department	(401) 942-2211
Rhode Island General Hospital	(401) 277-4000
Barnert Memorial Hospital (Dr. Cronin)	(201) 977-6764
Poison Control Center	(800) 962-1253
USEPA National Response Center	(800) 438-2427

In case of releases of significant amounts of contamination, the following agencies should be contacted:

Rhode Island Chemical and Oil Spills	(800) 424-8802
Rhode Island Air and Hazardous Waste	(401) 277-2808 (401) 277-2797
Rhode Island Water Supply	(401) 277-6867

10.5 EMERGENCY RESPONSE PERSONNEL

The SSO must have the primary role in responding to all on-site emergencies. All site personnel must contact the SSO, or his/her designee, in case of emergency. The SSO, or his/her designee, must be present on-site during all site work. If reasonable contact cannot be maintained, the SSO must carry a radio and each isolated activity group will also have a radio. If any emergency such as a fire, chemical exposure, or physical injury occurs, the SSO must be contacted immediately. The SSO, or his/her designee performing in this capacity, must have certification in First Aid. All site personnel must take direction from the SSO in cases of emergency response. If the SSO or his/her designee is not present, the Site Manager must respond to emergencies.

10.6 EMERGENCY DECONTAMINATION PROCEDURES

Decontamination of an injured or exposed worker must be performed only if decontamination does not interfere with essential treatment and does not make worse the injury or exposure.

If decontamination can be done, then wash, rinse, and/or cut off protective clothing and equipment.

If decontamination cannot be done, then the following action is recommended:

- o Wrap the victim in blankets, plastic or rubber to reduce contamination of other personnel; and
- o Alert emergency and off-site medical personnel to potential contamination.

SSO or other personnel familiar with the incident and site contaminants must accompany the victim to the hospital.

10.7 FIRST AID PROCEDURES

On-site medical treatment or first aid may be administered by the SSO or other personnel who have been certified in First Aid. General first aid procedures include:

- o Removing the injured or exposed person(s) from immediate danger.
- o Rendering first aid if necessary, and decontaminate affected personnel, if necessary.

- o Calling an ambulance for transport to local hospital immediately. This procedure should be followed even if there is no apparent serious injury.
- o Evacuating other personnel on-site to a safe place until the Site Manager (assisted by the SSO) determines that it is safe for work to resume.
- o Reporting the accident to the HSO and Project Manager immediately.

Information on Emergency First Aid Procedures is presented in Attachment J.

10.8 DIRECTIONS TO RHODE ISLAND HOSPITAL FROM SITE

- o Take Mill Street north about 0.3 mi. to Park Avenue.
- o Turn left onto Park Avenue and follow approximately 0.3 mi. to Route 10.
- o Bear right onto Rt. 10 and follow to I-95 (approximately 0.8 miles)
- o Bear right onto the entrance ramp for I-95 northbound. Take I-95 north to exit 18 (Thurbers Avenue Exit); the first exit after getting on (approximately 1.5 mi).
- o Bear left on the exit as to circle under under I-95. The exit terminates at Eddy St.
- o Turn right on Eddy St. and follow to Rhode Island Hospital (approximately 0.9 mi).
- o Rhode Island Hospital is on the left.

The directions to the hospital must be verified by the SSO prior to the initiation of fieldwork. Directions to the hospital are repeated in Attachment I.



MAP SOURCE:
USGS TOPOGRAPHIC
7.5 MINUTE QUADRANGLE,
PROVIDENCE, RHODE ISLAND,
1957 (PHOTOREVISED 1970 AND 1975).

DIRECTIONS TO RHODE ISLAND HOSPITAL FROM THE CIBA-GEIGY FACILITY CRANSTON, RHODE ISLAND

WOODWARD - CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
WAYNE, NEW JERSEY

DR. BY: KF	SCALE: --	PROJ. NO.: 87X4660
CK'D BY: MH	DATE: 18 AUG 1989	FIG. NO.: 10-1

SECTION 11

LABORATORY CONSIDERATIONS

11.1 GEOTECHNICAL LABORATORIES

Soil samples must not be sent to Geotechnical Laboratories without the written approval of the HSO.

11.2 CHEMICAL ANALYTICAL LABORATORY

The laboratory director must be informed of any contaminant levels, if known, in the samples that would require special handling procedures to reduce risk of exposure to laboratory personnel.

SECTION 12
HEALTH AND SAFETY PLAN COMPLIANCE AGREEMENT

An appropriate Health and Safety Plan compliance agreement form is presented below:

I, _____ (print name), have received a copy of the Health and Safety Plan for the RCRA Facility Investigation of the CIBA-GEIGY facility in Cranston, Rhode Island. I have read the plan, understand it, and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project for violating any of the safety requirements specified in the Health and Safety Plan.

Signed:

Signature

Date

Company

APPENDIX A
EMERGENCY RESPONSE/TOXICOLOGIC INFORMATION

AD89-036AA

ACETONE

Synonyms:

Dimethyl ketone • 2-Propanone • Pyroacetic ether

Description:

Colorless liquid, pungent odor

Occupational Exposure:

Celluloid • Cements • Chemical synthesis • Dyeing • Explosives •
Pharmaceuticals • Plastics • Solvent • Varnishes and lacquers

Threshold Limit Value:

750 ppm • 1780 mg/m³

Toxicity:

ROUTE OF ENTRY:

Ingestion • Inhalation

MODE OF ACTION:

Irritant • Depressant for central nervous system

SIGNS AND SYMPTOMS:

Defatting or eczematoid dermatitis • Conjunctivitis and corneal
erosion • Irritation of nose and throat • Headache • Dizziness
• Mental confusion • Weakness • Nausea and vomiting •
Bronchitis • Narcosis

DIAGNOSTIC TESTS:

Acetone in urine, blood, or alveolar air

TREATMENT:

Irrigate eyes with water
Wash contaminated areas of body with soap and water
Gastric lavage, if ingested, followed by saline catharsis
Symptomatic and supportive

DISABILITY:

No permanent effects reported

REFERENCE:

HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)

ANTIMONY

Synonyms:

Antimony regulus • Stibium

Description:

Silver white powder

Occupational Exposure:

Abrasives • Alloys • Cable sheathing • Foundries • Linotyping • Mining, smelting and refining • Pyrotechnics • Storage battery plates

Threshold Limit Value:

Antimony and compounds — 0.5 mg/m³
(suspect carcinogen in antimony trioxide production)
Stibene (antimony hydride)—see page 501

Toxicity:

ROUTE OF ENTRY:

Ingestion • Inhalation (dust and fume)

MODE OF ACTION:

Irritant • Binds sulfhydryl groups • Pneumoconiosis—antimoniosis

SIGNS AND SYMPTOMS:

Conjunctivitis
Dermatitis (vesicular or pustular lesions) sometimes with residual pigmentation
Orange staining of dental surfaces occurs if oral hygiene is poor
Rhinitis, perforation of the nasal septum, pharyngitis, laryngitis, tracheitis, bronchitis, and pneumonitis
Bitter taste, nausea, vomiting, diarrhea, and abdominal cramps
Chronic exposures lead to dry throat, headaches, dizziness, anorexia and nausea, sleeplessness

DIAGNOSTIC TESTS:

Blood antimony above 6 mg/100 g warrants removal from exposure
Urine antimony (normal < 2 µg/g creatinine) warrants removal from exposure
Pulmonary function changes are nonspecific
Pneumoconiosis from antimony oxides is characterized by very dense small opacities in the middle and lower lung fields—onset usually after 10 or more years of exposure

TREATMENT:

Irrigate eyes with water
Wash contaminated areas of body with soap and water
Treat skin burns as usual
Symptomatic and supportive
Dimercaprol has been recommended for severe systemic effects

DISABILITY:

No permanent effects reported

Preventive Measures:

Adequate ventilation • Chemical goggles • Approved respiratory protection • Protective clothing
No eating or smoking in work areas
Physical examinations of exposed personnel annually with special attention to skin and respiratory system
Preclude from exposure those individuals with chronic skin and pulmonary diseases

REFERENCE:

HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)

ARSENIC AND COMPOUNDS

Synonyms:

Elemental arsenic

Pentavalent compounds in use:

Arsenic acid • Arsenic pentoxide • Calcium arsenate • Lead arsenate

Trivalent inorganic compounds commonly encountered:

Arsenic trichloride • Arsenic trioxide • Calcium arsenite • Cupric arsenite • Lead arsenite • Sodium arsenite

Occupational Exposure:

Alloys • Antifouling paints • Copper smelting • Glass manufacture • Insecticides • Leather tanning • Metallurgy • Pigment production • Taxidermy • Textile printing • Wood preservative

Threshold Limit Value:

Arsenic — 0.2 mg/m³

Arsenic compounds, soluble — 0.2 mg/m³

Arsenic compounds, organic — 0.5 mg/m³ OSHA PEL

Arsenic compounds, inorganic — specific OSHA regulations apply

Toxicity: *HIGHLY TOXIC*

ROUTE OF ENTRY:

Ingestion • Inhalation • Percutaneous

MODE OF ACTION:

Inhibits oxidative phosphorylation

Inhibits lactate utilization

Fragments myelin sheaths with destruction of axis cylinder

Increases capillary permeability

Inorganic arsenicals can cause hepatic angiosarcoma, but none of these have been work related

Pulmonary and lymphatic cancers

SIGNS AND SYMPTOMS:

Acute industrial intoxication is more likely to arise from inhalation of ARSINE

Chronic intoxications can follow an insidious pattern

General:

Malaise and weakness • Anorexia and nausea • Weight loss

Skin: (usually one to six weeks after first exposure)

There may be an early erythematous flushing and pruritis

Diffuse, brown, dry, fine, scaly desquamative dermatitis—"smelter's itch"

Hyperpigmentation occurs and may be localized to areolae, axillae, and groins

Hyperkeratosis of palms and soles follows

Hair loss can occur

Brittle nails occasionally show transverse white bands—Mee's lines

Keratosis occur after 8 or more years exposure and epitheliomata after 15–20 years

Eyes:

Eyelid edema, conjunctivitis, and even corneal erosion are seen with corrosive arsenical vapors

Respiratory:

Nasal irritation with perforation of the septum

Inflammation of the mouth, pharyngitis, and hoarseness

Cough and chest pain

REFERENCE:

HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)

ARSENIC AND COMPOUNDS (*cont'd.*)

SIGNS AND SYMPTOMS (*cont'd.*):

Gastrointestinal:

Nausea, vomiting, abdominal pain, and diarrhea
Hepatic toxicity is possible

Hematopoietic:

Anemia, leukopenia, and aplastic anemia have been reported

Genitourinary:

Hematuria and albuminuria

Central nervous system: Effects may begin several weeks after exposure and findings are usually symmetrical

Numbness, burning, and tingling of hands and feet beginning distally and spreading centrally

Muscular weakness and ultimate atrophy

Fasciculation and gross tremors can occur

Ataxia and incoordination

Impaired sense of touch, pain, temperature, vibration, and position can occur

Decreased deep tendon reflexes with foot and wrist drop in later stages

Mental confusion

DIAGNOSTIC TESTS:

Arsenic in urine above 0.2 mg/liter is suggestive (but seafood ingestion, especially shellfish can produce substantial elevations of urinary arsenic for several days)

Hair and fingernail analysis may be helpful but reliability is questioned

TREATMENT: *TREAT AS AN EMERGENCY*

Exposure to arsenical solutions require immediate irrigation of the eyes and thorough washing of body

If ingested, gastric lavage, using ferric chloride tincture and sodium carbonate in an approximate 30:1 ratio, followed by administration of activated charcoal and a saline cathartic

Dimercaprol for severe intoxication:

3 mg/kg i.m. every four hours for two days, every six hours on third day, then twice daily for ten days

Topical dimercaprol has been recommended for arsenical skin damage, but evaluation is lacking

Dimercaprol does not seem to help reverse neurologic changes, thus should be given early if it is to be used

Exchange transfusions and hemodialysis have been recommended in special instances

Identification and measurement of arsenic species can assist in determining proper use of chelation therapy

Symptomatic and supportive

REFERENCE:

HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)

ARSENIC AND COMPOUNDS (*cont'd.*)

DISABILITY:

Liver, hematopoietic and nervous system damage may be permanent
Pulmonary and lymphatic cancer

Preventive Measures:

Wet methods where possible

Adequate ventilation • Chemical goggles for handling liquid solutions • Approved respiratory protection • Protective clothing including gloves and head hood

No eating or smoking in work area • Good personal hygiene

Physical examinations of exposed personnel periodically with special attention to skin and nervous system

Preclude from exposure those individuals with diseases of skin, blood, liver, lungs, kidney, and central nervous system

REFERENCE:

HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)

BARIUM AND COMPOUNDS

Synonyms:

Insoluble compound: Barium sulfate

Soluble compounds: Barium carbonate • Barium chloride • Barium hydroxide • Barium nitrate • Barium sulfide

Description:

White to yellow granules, powders, and crystals

Occupational Exposure:

Beet sugar purification • Brick and tile manufacture • Electronics • Fire extinguisher • Glass and ceramics • Mold lubricant • Paper manufacture • Pharmaceuticals • Pyrotechnics • Rodenticide • Rubber and linoleum • X-ray diagnosis

Threshold Limit Value:

Soluble compounds — 0.5 mg/m³

Toxicity: SOLUBLE COMPOUNDS ARE HIGHLY TOXIC

ROUTE OF ENTRY:

Ingestion • Inhalation

MODE OF ACTION:

Soluble compounds: Irritants • Cause hypokalemia • Acidosis

Insoluble barium produces a pneumoconiosis

SIGNS AND SYMPTOMS:

Soluble salts:

Irritation of eyes and mucous membranes • Dermatitis and burns

If ingested: Nausea • Vomiting • Abdominal pain • Slow, irregular pulse • Cyanosis • Dyspnea • Muscular paralysis • Hypokalemia

Insoluble compounds:

Baritosis—a benign pneumoconiosis associated with cough but no pulmonary function abnormalities

DIAGNOSTIC TESTS:

Barite pneumoconiosis appears on the chest x-ray as profusely distributed small (1–4 mm) irregular opacities

TREATMENT: TREAT SOLUBLE COMPOUND INTOXICATION AS AN EMERGENCY

Irrigate eyes with water

Wash contaminated areas of body with soap and water

Gastric lavage, if ingested, followed by saline catharsis (use sodium or magnesium sulfates to precipitate unabsorbed barium salts in intestinal tract and aid excretion)

Vigorous diuresis

Monitor electrolytes carefully

Calcium gluconate for muscular spasms

Oxygen

Symptomatic and supportive

DISABILITY:

Recovery is to be expected

Baritosis produces no respiratory incapacity and x-ray changes are reversible after cessation of exposure

Preventive Measures:

Adequate ventilation • Chemical goggles • Approved respiratory protection • Rubber gloves and aprons when indicated

Physical examination annually for employees exposed to barite dust, including chest x-ray and pulmonary function studies

Preclude from exposure to insoluble barium those individuals with pulmonary diseases

REFERENCE:

HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)

CHLOROBENZENES

Synonyms:

Dichlorobenzenes: *o*-, *m*-, *p*- • Monochlorobenzene • Trichlorobenzenes

Description:

Colorless liquids and crystals

Occupational Exposure:

Chemical intermediate • Disinfectant • Dyestuffs • Fumigant • Heat transfer agent • Insecticide • Pharmaceuticals • Solvent

Threshold Limit Value:

o-dichloro — 50 ppm • 300 mg/m³
p-dichloro — 75 ppm • 450 mg/m³
monochloro — 75 ppm • 350 mg/m³
1,2,4-trichloro — 5 ppm • 40 mg/m³

Toxicity:

ROUTE OF ENTRY:

Inhalation • Percutaneous

MODE OF ACTION:

Irritant • Central nervous system depressant • Liver and kidney damage are possible

SIGNS AND SYMPTOMS:

Conjunctivitis and rhinitis • Headache • Skin burns from prolonged contact

DIAGNOSTIC TESTS:

None established

TREATMENT:

Irrigate eyes with water
Wash contaminated areas of body with soap and water
Gastric lavage, if ingested, followed by saline catharsis
Symptomatic and supportive

DISABILITY:

No permanent effects reported

Preventive Measures:

Adequate ventilation • Chemical goggles • Approved respiratory protection • Rubber gloves and protective clothing
Physical examination of exposed personnel on a regular basis including studies of liver and kidney function
Preclude from exposure those individuals with liver and kidney disease

REFERENCE:

HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)

CHROMIUM AND COMPOUNDS

Synonyms: (common forms)

Chromic acid • Chromic anhydride • Lead chromate
Chromium metal
Dichromate salts—sodium, potassium and others
Hexavalent compounds—irritants, corrosives, and carcinogens
Trivalent compounds—generally considered nontoxic • Chromic oxide • Chromic sulfate

Description:

Metal is silvery gray
Compounds frequently black or green crystals

Occupational Exposure:

Anodizing • Antioxidants • Batteries • Catalysts • Chemical synthesis • Dyes • Explosives • Leather tanning • Paints • Refractories • Steel alloys • Welding • Wood preservatives

Threshold Limit Value:

Chromium — 0.5 mg/m³
Chromium fume and dust — 0.1 mg/m³
Chromium insoluble salts — OSHA 1 mg/m³
Chromium II compounds — 0.5 mg/m³
Chromium III compounds — 0.5 mg/m³
Chromium VI compounds — 0.05 mg/m³

Toxicity:

ROUTE OF ENTRY:

Inhalation • Percutaneous through broken skin

MODE OF ACTION:

Irritant • Corrosive • Sensitizer • Carcinogenic

SIGNS AND SYMPTOMS:

Eyes: Conjunctivitis • Keratitis • Ulcerations of the lids

Skin: Dermatitis has been reported from both trivalent and hexavalent forms, but more serious effects are related to hexavalent chromes; hyperkeratosis also occurs • Sensitization dermatitis • Corrosive lesions—"chrome holes"—most frequently on the hands and forearms

Upper respiratory tract: Nasal irritation with epistaxis, rhinitis and perforated septum • Anosmia • Sinusitis and papillomas • Pharyngitis and laryngitis

Pulmonary: High concentrations may cause cough, chest pain, wheezing, fever and pneumonitis; asthma has been reported also • Chromite dust has produced pneumoconiosis with slightly impaired pulmonary function • Bronchogenic carcinoma is associated more frequently with long exposure to less soluble chromium compounds

Gastrointestinal: Dental erosion and discoloration • Anorexia, nausea, and abdominal pain • Impaired liver function

DIAGNOSTIC TESTS:

Patch tests for sensitization
Chromium in blood and urine indicates exposure

REFERENCE:

HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)

CHROMIUM AND COMPOUNDS (cont'd.)

TREATMENT:

Irrigate eyes with water
Wash contaminated areas of body with soap and water
Allergic dermatitis may be treated with local cortisone or a 10% solution of ascorbic acid to reduce hexavalent forms to trivalent and thus diminish penetration
Skin ulcers will respond to the application of 10% EDTA in a lanolin base every 24 hours with curettage as necessary
Chelation and hemodialysis have been suggested for acute intoxications
Symptomatic and supportive

DISABILITY:

Skin lesions usually not disabling
Anosmia and sensitization may be permanent
Pneumoconiosis has not caused serious impairment

Preventive Measures:

Adequate ventilation with regular monitoring of the work environment • Chemical goggles • Approved respiratory protection • Rubber gloves, aprons, and boots
No eating or smoking in work area
Vaseline applied to the nose before going to work may reduce nasal irritation
Physical examination of exposed personnel on a regular basis including chest x-ray, pulmonary function, liver and kidney function tests and special attention to the skin
Urinary chrome monitoring may be helpful
Remove from exposure those who become sensitized

REFERENCE:

**HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)**

DICHLOROBENZENE

Synonyms:

Two isomers: *o*-, *p*-

Description:

Clear liquid and crystals

Occupational Exposure:

Chemical synthesis • Disinfectant • Fumigant • Insecticide • Solvent

Threshold Limit Value:

ortho— 50 ppm • 300 mg/m³

para—75 ppm • 450 mg/m³

Toxicity:

ROUTE OF ENTRY:

Inhalation • Percutaneous

MODE OF ACTION:

Irritant • Sensitizer • Liver damage

SIGNS AND SYMPTOMS:

Irritation of the eyes and nose with rhinitis

Skin blisters with subsequent pigmentation

Allergic purpura has been reported following exposure to *para*-dichlorobenzene

Headache, anorexia, nausea, vomiting, weight loss, jaundice, and cirrhosis

Leukemia has been reported

DIAGNOSTIC TESTS:

2,5-Dichlorophenol in urine (for *p*-dichlorobenzene)

TREATMENT:

Irrigate eyes with water

Wash contaminated areas of body with soap and water

Symptomatic and supportive

DISABILITY:

No permanent effects reported

Leukemia?

Preventive Measures:

Adequate ventilation • Chemical goggles • Approved respiratory protection • Rubber gloves and protective clothing

Physical examination of exposed personnel on a regular basis including studies of liver function

Preclude from exposure those individuals with liver disease

REFERENCE:

HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)

DICHLOROETHYLENE

Synonyms:

Acetylene dichloride • 1,2-Dichloroethylene • *sym*-Dichloroethylene

Description:

Colorless liquid, ethereal odor

Occupational Exposure:

Chemical synthesis • Lacquers • Perfumes • Pharmaceuticals •
Refrigerant • Solvent • Thermoplastics

Threshold Limit Value:

200 ppm • 790 mg/m³

Toxicity:

ROUTE OF ENTRY:

Inhalation

MODE OF ACTION:

Irritant • Central nervous system depressant
Possible liver and kidney damage

SIGNS AND SYMPTOMS:

Irritation of eyes • Vertigo and narcosis • Nausea and vomiting

DIAGNOSTIC TESTS:

None established

TREATMENT:

Irrigate eyes with water
Wash contaminated areas of body with soap and water
Symptomatic and supportive

DISABILITY:

No permanent effects reported

Preventive Measures:

Adequate ventilation • Chemical goggles • Approved respiratory protection

REFERENCE:

HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)

ETHYL BENZENE

Synonyms:

Phenylethane

Description:

Colorless liquid, aromatic odor

Occupational Exposure:

Fuel additive • Solvent • Synthetic rubber

Threshold Limit Value:

100 ppm • 435 mg/m³

Toxicity:

ROUTE OF ENTRY:

Inhalation • Percutaneous

MODE OF ACTION:

Irritant • Central nervous system depressant
Blood and liver changes have been reported

SIGNS AND SYMPTOMS:

Conjunctivitis and keratitis
Irritation of respiratory tract
Dermatitis
Dizziness • Drowsiness
Menstrual disorders have been reported

DIAGNOSTIC TESTS:

Ethyl benzene in blood
Mandelic acid in urine

TREATMENT:

Irrigate eyes with water
Wash contaminated areas of body with soap and water
Gastric lavage, if ingested, followed by saline catharsis
Symptomatic and supportive

DISABILITY:

No permanent effects reported

Preventive Measures:

Adequate ventilation • Chemical goggles • Approved respiratory protection • Rubber gloves
Physical examination of exposed personnel at regular intervals with special attention to hematopoietic changes and liver function

REFERENCE:

HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)

LEAD, INORGANIC

Synonyms:

Plumbum

Description:

Metal is blue-gray

Salts are variable colored crystals and masses

Occupational Exposure:

Alloys • Batteries • Corrosion-resistant surfaces • Fingerprint detection powders • Glass making • Manufacture of tetraethyl lead • Metallurgy • Pigment • Plastics • Solder • X-ray shields

Threshold Limit Value:

Fume and dust — 0.15 mg/m³

Compounds — 50 µg/m³ OSHA

Specific OSHA regulations apply

Toxicity:

ROUTE OF ENTRY:

Ingestion • Inhalation

MODE OF ACTION:

Interferes with heme synthesis at two levels by interrupting delta-amino levulinic acid dehydratase (ALA-D) and ferrochelatase

Interferes with neurotransmitters

Causes nephropathy

Direct irritative action on gastrointestinal muscle

Gonadotoxic

SIGNS AND SYMPTOMS:

Acute stress such as injury, severe illness, dietary indiscretions, and emotional stress may precipitate symptoms of lead intoxication in persons whose metabolism of lead is in delicate balance

Lead intoxication tends to be a chronic disease covering a broad spectrum of adverse effects

General: Pallor • Weakness • Weight loss • Lassitude

Gastrointestinal: Metallic taste • Burton's lead line if oral hygiene is poor • Anorexia • Nausea • Vomiting • Constipation • Abdominal colic may occur

Genitourinary: Chronic nephritis and nephrosclerosis have been reported

Central nervous system: Impaired psychomotor performance • Irritability • Impaired concentration • Sleep disturbances • Depressed deep tendon reflexes • Peripheral neuropathy • Encephalopathy is now almost entirely confined to children

Musculoskeletal: Muscular aches and pains along with arthralgia do occur • Lead may be associated with gout nephropathy—"saturnine gout"

Hematopoietic: Normocytic, normochromic anemia with erythrocyte stippling and short red cell life

Reproductive: Hypospermia and oligospermia, increased incidence of abortions, miscarriages, and stillbirths

REFERENCE:

HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)

LEAD, INORGANIC (cont'd.)

DIAGNOSTIC TESTS:

Blood lead (normal < 35 µg/g creatinine)
Urine lead (normal < 50 µg/g creatinine)
Urine delta-amino levulinic acid and coproporphyrin are also useful

TREATMENT:

Remove patient from exposure
Therapy may not need to be dramatic
Chelation when indicated is done with CaEDTA using 50 mg/kg intravenously each day in divided doses up to 5 days—the course may be repeated after several days rest; renal status must be checked before and during therapy
Prophylactic chelation is contraindicated
Symptomatic and supportive

DISABILITY:

Encephalopathy, paralyses, and nephropathy can result in permanent impairment

Preventive Measures:

Adequate ventilation with regular monitoring of work environment •
Approved respiratory protection • Protective clothing where indicated
No eating or smoking in work area • Good personal hygiene
Physical examination of exposed personnel at regular intervals with special attention to target organ systems and including blood lead determinations
Preclude from exposure those with elevated lead levels, those with diseases of the central nervous system, kidneys, and blood
Special review should be made of those who are in the reproductive age group

REFERENCE:

HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)

MANGANESE AND COMPOUNDS

Synonyms:

Manganese dioxide • Potassium permanganate • Pyrolusite

Description:

Metal is red-gray; compounds are multicolored

Occupational Exposure:

Alloys • Batteries • Bleaches • Chemical synthesis • Gasoline additives • Glass and ceramics • Mining and smelting • Steel manufacture

Threshold Limit Value:

Dusts and compounds — 5 mg/m³

Fume — 1 mg/m³

Toxicity:

ROUTE OF ENTRY:

Inhalation • Percutaneous (antiknock gasoline additive)

MODE OF ACTION:

Irritant • Central nervous system damage

SIGNS AND SYMPTOMS:

Conjunctivitis and corneal damage from irritant salts

Papuloerythematous dermatitis

Acute pulmonary effects, consisting of dyspnea, shallow respiration and fever mimic metal fume fever

Central nervous system: Usually after 1–2 years exposure

Stage I—subclinical, reversible—Asthenia, indifference, irritability, headache, anorexia, sleep disturbance, decreased libido, arthralgia, muscular spasm and diminished fine motor coordination • Emotional and behavioral disorders called “manganic psychosis” are more frequently seen among miners at this stage

Stage II—clinical or intermediate—Speech becomes slow and stammering with monotonous voice; mask-like facies; excessive salivation; awkward gestures; tremors of tongue, arms, and legs; gait disturbances

Stage III—late—Muscular rigidity, bradykinesia with slow spasmodic gait, emotional instability, postural instability and imbalance, diminished mental ability

DIAGNOSTIC TESTS:

Blood and urine manganese levels do not correlate with symptoms

TREATMENT:

Irrigate eyes with water

Wash contaminated areas of body with soap and water

Chronic intoxications have been treated with edetic acid and levodopa with mixed results

Symptomatic and supportive

DISABILITY:

Local damage from irritant salts can be permanent

Recovery from stage III manganism is unexpected

Preventive Measures:

Adequate ventilation • Chemical goggles • Approved respiratory protection

No eating or smoking in work areas • Good personal hygiene

Physical examination of exposed personnel at regular intervals with special attention to neurologic and psychologic findings

Preclude from exposure those individuals with neurologic and psychologic disorders

Remove from exposure those who exhibit stage I symptoms

REFERENCE:

HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)

METHYLENE CHLORIDE

Synonyms:

Dichloromethane • Methylene dichloride

Description:

Colorless liquid, sweetish odor

Occupational Exposure:

Degreaser • Extractant • Fumigant • Paint removers • Plastic processing • Solvent

Threshold Limit Value:

100 ppm • 350 mg/m³

Toxicity:

ROUTE OF ENTRY:

Inhalation • Percutaneous

MODE OF ACTION:

Irritant

Central nervous system depressant

Metabolized to CO which then forms carboxyhemoglobin

SIGNS AND SYMPTOMS:

Irritation of eyes

Dermatitis and skin burns

Cough, dyspnea, pulmonary edema

Headache, anorexia, and nausea

Dizziness, drowsiness, irritability, poor concentration, numbness and tingling of extremities, unconsciousness

DIAGNOSTIC TESTS:

Methylene chloride in expired air and blood

Carboxyhemoglobin (because methylene chloride is metabolized slowly, the COHb level remains high for a long time)

TREATMENT:

Irrigate eyes with water

Wash contaminated areas of body with soap and water

Treat burns in normal manner

Carbon monoxide intoxication may require special care

Symptomatic and supportive

DISABILITY:

Permanent cerebral effects secondary to CO poisoning have been reported

Preventive Measures:

Adequate ventilation • Chemical goggles • Approved respiratory protection • Rubber protective clothing

REFERENCE:

**HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)**

PHENOL

Synonyms:

Carbolic acid • Hydroxy benzene • Phenyl hydroxide • Phenylic acid

Description:

White crystalline mass

Occupational Exposure:

Cosmetics • Disinfectant • Dyes • Fertilizer manufacture • Germicidal
paints • Laboratory reagent • Pharmaceuticals • Resins • Solvent

Threshold Limit Value:

5 ppm • 19 mg/m³

Toxicity: *HIGHLY TOXIC*

ROUTE OF ENTRY:

Ingestion • Inhalation • Percutaneous

MODE OF ACTION:

Corrosive

Central nervous stimulation then depression

Metabolic acidosis

Liver and kidney damage

SIGNS AND SYMPTOMS:

Acute:

Conjunctival and corneal necrosis

Severe skin burns, with early blanching

If ingested: Corrosion of the mouth, throat and gastro-
intestinal tract with perforation of the gut, shock,
collapse, and convulsions

Dyspnea, cough, cyanosis, and pulmonary edema

Headache, dizziness, weakness, sweating, tremors, con-
vulsions, and coma

Oliguria and anuria, hematuria and hemoglobinuria

Shock and acidosis

Chronic exposure causes a syndrome called *phenol marasmus*
characterized by headache, fatigue and weakness, vertigo,
anorexia and weight loss, salivation, nervousness, muscular
aches and pains, very dark urine and ochronosis-like pig-
mentation of the sclerae and skin over the nose and molar
eminences

DIAGNOSTIC TESTS:

Phenol in blood and urine

REFERENCE:

HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)

PHENOL (*cont'd.*)

TREATMENT: *TREAT AS AN EMERGENCY*

Decontamination team must exercise care

Terminate exposure

Remove all clothing

Irrigate eyes and wash contaminated areas of body with a mixture of polyethylene glycol 300/industrial methylated spirits (PEG 300/IMS—2:1 by volume) or similar preparation that will absorb phenol

Special attention should be given to body areas that entrap phenol, such as matted hair, skin folds, and beneath nails, and an effort should be made to swab clear the epidermal-phenol protein complex

Hospitalize serious exposures to facilitate care for acidosis, shock, convulsions, and fluid balance

Symptomatic and supportive

DISABILITY:

Burn scars, leucoderma, and other sequelae may cause permanent impairment

Preventive Measures:

Adequate ventilation • Chemical goggles or face shield • Approved respiratory protection • Rubber gloves, aprons, and boots

Physical examination of exposed personnel on a regular basis including liver and kidney function studies

Preclude from exposure those individuals with diseases of central nervous system, liver, kidneys, and lungs

REFERENCE:

HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)

TOLUENE

Synonyms:

Methyl benzene • Phenyl methane • Toluol

Description:

Colorless liquid, aromatic odor

Occupational Exposure:

Adhesives • Chemical synthesis • Detergents • Dyes • Explosives •
Fuel • Paints and lacquers • Pharmaceuticals • Printing • Solvent

Threshold Limit Value:

100 ppm • 375 mg/m³

Toxicity:

ROUTE OF ENTRY:

Inhalation • Percutaneous

MODE OF ACTION:

Irritant • Central nervous system depressant
Kidney and liver damage can occur

SIGNS AND SYMPTOMS:

Conjunctivitis • Keratitis
Defating dermatitis • Skin paresthesias
Respiratory tract irritation with chemical pneumonitis
Headache, dizziness, drowsiness, mental confusion, incoordination, and ataxia followed by narcosis
Anorexia • Nausea • Vomiting
Liver and kidney damage in massive exposures with hepatomegaly, albuminuria, hematuria, and oliguria

DIAGNOSTIC TESTS:

Toluene in expired air and blood
Hippuric acid in urine (normal < 1.5 g/g creatinine)

TREATMENT:

Irrigate eyes with water
Wash contaminated areas of body with soap and water
Symptomatic and supportive

DISABILITY:

Permanent central nervous system changes have been reported

Preventive Measures:

Ascertain benzene content of all toluene used
Adequate ventilation • Chemical goggles • Approved respiratory protection • Rubber gloves
Physical examination of exposed personnel on a regular basis with special attention to the eyes and nervous system and including a blood count and studies of liver and kidney function
Preclude from exposure those with diseases of the central nervous system, liver, and kidneys

REFERENCE:

**HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)**

VANADIUM AND COMPOUNDS

Synonyms:

Ammonium metavanadate • Sodium vanadite • Vanadium pentoxide •
Others

Description:

Vanadium is a silvery white solid
Compounds are yellow powders and red crystals

Occupational Exposure:

Alloys • Catalyst • Chemical reagents • Cleaning oil- and gas-fired
boilers • Electronics • Glass and ceramics • Inks • Mordants •
Paints • Pesticides • Photography

Threshold Limit Value:

0.05 mg/m³

Toxicity:

ROUTE OF ENTRY:

Inhalation

MODE OF ACTION:

Ammonium metavanadate and vanadium pentoxide appear to
be irritants

Adverse effects are not reported with vanadium itself or other
compounds

Sensitizer

SIGNS AND SYMPTOMS:

Conjunctivitis with lacrimation and burning

Rhinitis with sneezing and epistaxis and sore throat

Cough, retrosternal discomfort, rales, dyspnea, and wheezing
respiration accompany tracheitis, bronchitis, bronchopneu-
monia, and even pulmonary edema

A greenish discoloration of the tongue may be seen and com-
plaints of metallic taste and gastrointestinal irritation have
been reported

Headache, fatigue, and weakness have also been noted

Dermatitis and seborrhea-like eczema can occur

DIAGNOSTIC TESTS:

Vanadium in urine (normal < 1 µg/g creatinine)

Patch test may be positive if eczema has occurred

Transitory decline in FEV₁ and FVC is common

TREATMENT:

Irrigate eyes with water

Wash contaminated areas of body with soap and water

Cardiorespiratory support as indicated

Symptomatic and supportive

DISABILITY:

Respiratory symptoms may persist for years but no permanent
effects are reported

Preventive Measures:

Adequate ventilation • Chemical goggles • Approved respiratory pro-
tection

Physical examination of exposed personnel at regular intervals
including tests of pulmonary function

REFERENCE:

**HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)**

XYLENE

Synonyms:

Dimethyl benzene • Three isomers: *o*-, *m*-, *p*-xylene

Description:

Clear liquid, aromatic odor

Commercial preparations may contain benzene

Occupational Exposure:

Adhesives • Cements • Chemical synthesis • Cleaning fluids • Degreasing • Dyes • Fuel additive • Inks • Insect repellants • Paints and lacquers • Perfumes • Pharmaceuticals • Resins • Solvent

Threshold Limit Value:

100 ppm • 435 mg/m³

Toxicity:

ROUTE OF ENTRY:

Inhalation • Percutaneous

MODE OF ACTION:

Irritant

Central nervous system depression

Renal and hepatic damage

SIGNS AND SYMPTOMS:

Conjunctivitis • Keratitis

Irritation of nose and throat

Defatting dermatitis

Headache • Vertigo • Mental confusion • Drowsiness • Ataxia •

Narcosis

Anorexia • Nausea • Vomiting • Gastric discomfort

Renal and hepatic damage have been reported

DIAGNOSTIC TESTS:

Xylene in expired air and blood

Methyl hippuric acid in urine

TREATMENT:

Irrigate eyes with water

Wash contaminated areas of body with soap and water

Symptomatic and supportive

DISABILITY:

No permanent effects reported

Preventive Measures:

Adequate ventilation • Chemical goggles • Approved respiratory protection • Rubber gloves

Physical examination of exposed personnel on a regular basis with special attention to the eyes and central nervous system and including a blood count and studies of liver and kidney function

Preclude from exposure those with diseases of the central nervous system, liver, kidneys, and blood

REFERENCE:

HANDBOOK OF INDUSTRIAL TOXICOLOGY, THIRD EDITION;
E. R. PLUNKETT, M. D. (1987)

ATTACHMENT A
SAFETY GUIDELINES FOR DRILLING

SAFETY GUIDELINES FOR DRILLING

Drill rig maintenance and safety is the responsibility of the drill rig operator. The following is provided as a general guideline for safe drilling practices on site.

OFF-ROAD MOVEMENT OF DRILL RIGS

The following safety guidelines relate to off-road movement:

Before moving a drill rig, first walk the route of travel, inspecting for depressions, slumps, gulleys, ruts and similar obstacles.

Always check the brakes of a drill rig carrier before traveling, particularly on rough, uneven or hilly ground.

Discharge all passengers before moving a drill rig on rough or hilly terrain.

Engage the front axle (for 4x4, 6x6, etc., vehicles or carriers) when traveling off highway on hilly terrain.

Use caution when traveling side-hill. Conservatively evaluate side-hill capability of drill rigs, because the arbitrary addition of drilling tools may raise the center of mass. When possible, travel directly uphill or downhill.

Attempt to cross obstacles such as small logs and small erosion channel or ditches squarely, not at an angle.

Use the assistance of someone on the ground as a guide when lateral or overhead clearance is close.

After the drill rig has been moved to a new drilling site, set all brakes and/or locks. When grades are steep, block the wheels.

Never travel off-road with the mast (derrick) of the drill rig in the raised or partially raised position.

Tie down loads on the drill rig and support trucks during transport.

OVERHEAD AND BURIED UTILITIES

The use of a drill rig near electrical power lines and other utilities requires that special precautions be taken by both supervisors and members of the exploration crew. Electricity can shock, it can burn and it can cause death.

Overhead and buried utilities should be located, noted and emphasized on all boring location plans and boring assignment sheets.

Before raising the drill rig mast (derrick) in the vicinity of power lines, walk completely around the drill rig. Determine what the minimum distance from any point on the drill rig to the nearest power line will be when the mast is raised and/or being raised. Do not raise the mast or operate the drill rig if this distance is less than 20 ft. In general, the distance between the overhead power line and the boom should be no less than the height of the boom.

Keep in mind that both hoist and overhead power lines can be moved toward each other by the wind.

Drilling personnel should double-check any site underground electrical and piping drawings prior to initiating drilling. If an obstruction is encountered during drilling, proceed with extreme caution until the possibility of an exposed electrical line or combustible product pipeline is excluded.

CLEARING THE WORK AREA

Prior to drilling, adequate site cleaning and leveling should be performed to accommodate the drill rig and supplies and provide a safe working area. Drilling should not be commenced when tree limbs, protruding objects, unstable ground or site obstructions or debris cause unsafe tool handling conditions and/or limited, awkward work spaces. An area clear of obstructions or debris should be maintained 180 degrees around the drilling or sampling activities, where practical.

Note: In coordination with the Drilling Crew, the Site Safety Officer will review the precautions taken to insure that the drill rig is leveled and stabilized.

HOUSEKEEPING ON AND AROUND THE DRILL RIG

The first requirement for safe field operations is that the drilling crew safety supervisor understand and fulfill the responsibility for maintenance and "housekeeping" on and around the drill rig.

Suitable storage locations should be provided for all tools, materials and supplies so that they can be conveniently and safely handled without hitting or falling on a member of the drill crew or a visitor, without creating tripping hazards, and without protruding at eye or head level.

Avoid storing or transporting tools, materials or supplies within or on the mast (derrick) of the drill rig.

Pipe, drill rods, bit casings, augers and similar drilling tools should be orderly stacked on racks or sills to prevent spreading, rolling or sliding.

Penetration or other driving hammers should be placed at a safe location on the ground or be secured to prevent movement when not in use.

Work areas, platforms, walkways, scaffolding and other accessways should be kept free of materials, obstructions and substances such as ice, excess grease or oil that could cause a surface to become slick or otherwise hazardous.

Keep all controls, control linkages, warning and operation lights and lenses free of oil, grease and/or ice.

Do not store gasoline in any portable container other than a non-sparking, red container with a flame arrester in the fill spout and having the word "gasoline" easily visible.

Welding gas cylinders should be secured and stored in an upright position to avoid leaks.

SAFE USE OF HAND TOOLS

There are almost an infinite number of hand tools that can be used on or around a drill rig. "Use the tool for its intended purpose" is the most important rule. The following are a few specific and some general suggestions which apply to safe use of several hand tools that are often used on and around drill rigs.

When a tool becomes damaged, either repair it before using it again or get rid of it.

When using a hammer, any kind of hammer for any purpose, wear safety glasses and require all others near you to wear safety glasses.

When using a chisel, any kind of chisel, for any purpose, wear safety glasses and require all others around you to wear safety glasses.

Keep all tools cleaned and orderly stored when not in use.

Replace hook and heel jaws when they become visibly worn.

When breaking tool joints on the ground or on a drilling platform, position your hands so that your fingers will not be smashed between the wrench handle and the ground or the platform, should the wrench slip or the joint suddenly let go.

SAFE USE OF WIRE LINE HOISTS, WIRE ROPE AND HOISTING HARDWARE

The use of wire line hoists, wire rope and hoisting hardware should be as stipulated by the American Iron and Steel Institute's Wire Rope Users Manual.

All wire ropes and fittings should be visually inspected during use and thoroughly inspected at least once a week for: abrasion, broken wires, wear, reduction in rope diameter, reduction in wire diameter, fatigue, corrosion, damage from heat, improper weaving, jamming, crushing, bird caging, kinking, core protrusion and damage to lifting hardware and any other feature that would lead to failure. Wire ropes should be replaced when inspection indicates excessive damage according to the wire rope users manual.

If a ball-bearing type hoisting swivel is used to hoist drill rods, swivel bearings should be inspected and lubricated daily to assure that the swivel freely rotates under load.

If a rod slipping device is used to hoist drill rods, do not drill through or rotate drill rods through the slipping device, do not hoist more than 1 ft (0.3m) of the drill rod column above the top of the mast (derrick), do not hoist a rod column with loose tool joints and do not make up, tighten or loosen tool joints while the rod column is being supported by a slipping device. If drill rods should slip back into the borehole, do not attempt to brake the fall of the rods with your hands.

Most sheaves on drill rigs are stationary with a single part line. The number of parts of line should not ever be increased without first consulting with the manufacturer of the drill rig. Wire ropes must be properly matched with each sheave.

The following procedures and precautions must be understood and implemented for safe use of wire ropes and rigging hardware.

Use tool handling hoists only for vertical lifting of tools (except when angle hole drilling). Do not use tool handling hoists to pull on objects away from the drill rig; however, drills may be moved using the main hoist as the wire rope is pulled through proper sheaves according to the manufacturer's recommendations.

When stuck tools or similar loads cannot be raised with a hoist, disconnect the hoist line and connect the stuck tools directly to the feed mechanism of the drill. Do not use hydraulic leveling jacks for added pull to the hoist line or the feed mechanism of the drill.

When attempting to pull out a mired down vehicle or drill rig carrier, only use a winch in the front or rear of the vehicle or drill rig carrier and stay as far as possible away from the wire rope. Do not attempt to use tool hoists to pull out a mired down vehicle or drill rig carrier.

Minimize shock loading of a wire rope - apply loads smoothly and steadily.

- o Protect wire rope from sharp corners or edges.
- o Replace faulty guides and rollers.
- o Replace worn sheaves or worn sheave bearings.
- o Replace damaged safety latches on safety hooks before using.

- o Know the safe working load of the equipment and tackle being used. Never exceed this limit.
- o Clutches and brakes of hoists should be periodically inspected and tested.
- o Know and do not exceed the rated capacity of hooks, rings, links, swivels, shackles and other lifting aids.
- o Always wear gloves when handling wire ropes.
- o Do not guide wire ropes on hoist drums with your hands.
- o Following the installation of a new wire rope, first lift a light load to allow the wire rope to adjust.
- o Never carry out any hoisting operations when the weather conditions are such that hazards to personnel, the public or property are created.
- o Never leave a load suspended in the air when the hoist is unattended.
- o Keep your hands away from hoists, wire rope, hoisting hooks, sheaves and pinch points as slack is being taken up and when the load is being hoisted.
- o Never hoist the load over the head, body or feet of any personnel.

SAFE USE OF AUGERS

The following general procedures should be used when advancing a boring with continuous flight or hollow-stem augers:

- o Prepare to start an auger boring with the drill rig level, the clutch or hydraulic rotation control disengaged, the transmission in low gear and the engine running at low RPM.
- o The operator and tool handler should establish a system of responsibility for the series of various activities required for auger drilling, such as connecting and disconnecting auger sections, and inserting and removing the auger fork. The operator must assure that the tool handler is well away from the auger column and that the auger fork is removed before starting rotation.
- o Only use the manufacturer's recommended method of securing the auger to the power coupling. Do not touch the coupling or the auger with your hands, a wrench or any other tools during rotation.
- o Whenever possible, use tool hoists to handle auger sections.
- o Never place hands or fingers under the bottom of an auger section when hoisting the auger over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.
- o Never allow feet to get under the auger section that is being hoisted.
- o When rotating augers, stay clear of the rotating auger and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason whatever.
- o Never place your hands between the drill rig and an auger, even when attempting to free a damaged or bound Shelby tube from the auger.
- o Never use your hands or feet to move cuttings away from the auger.

- o Augers should be cleaned only when the drill rig is in neutral and the augers are stopped from rotating.

SAFETY DURING ROTARY AND CORE DRILLING

Rotary drilling tools should be safety checked prior to drilling:

- o Water swivels and hoisting plugs should be lubricated and checked for "frozen" bearings before use.
- o Drill rod chuck jaws should be checked periodically and replaced when necessary.
- o The capacities of hoists and sheaves should be checked against the anticipated weight to the drill rod string plus other expected hoisting loads. All cables should be inspected daily.

Special precautions that should be taken for safe rotary or core drilling involve chucking, joint break, hoisting and lowering of drill rods:

- o Drill rods should not be braked during lowering into the hole with drill rod chuck jaws.
- o Drill rods should not be held or lowered into the hole with pipe wrenches.
- o If a string of drill rods are accidentally or inadvertently released into the hole, do not attempt to grab the falling rods with your hands or a wrench.
- o In the event of a plugged bit or other circulation blockage, the high pressure in the piping and hose between the pump and the obstruction should be relieved or bled down before breaking the first tool joint.

- o When drill rods are hoisted from the hole, they should be cleaned for safe handling with a rubber or other suitable rod wiper. Do not use your hands to clean drilling fluids from drill rods.
- o If work must progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with a rough surface, fitted cover panels of adequate strength to hold drill rig personnel.
- o Drill rods should not be lifted and leaned unsecured against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay the rods down.
- o All hydraulic lines should be periodically inspected for integrity and replaced as needed.

START-UP

All drill rig personnel and visitors should be instructed to "stand clear" of the drill rig immediately prior to and during starting of an engine.

Make sure all gear boxes are in neutral, all hoist levers are disengaged, all hydraulic levers are in the correct nonactuating positions and the cathead rope is not on the cathead before starting a drill rig engine.

GENERAL SAFETY DURING DRILLING OPERATIONS

Safety requires the attention and cooperation of every worker and site visitor.

Do not drive the drill rig from hole to hole with the mast (derrick) in the raised position.

Before raising the mast (derrick) look up to check for overhead obstructions. (Refer to previous Section on overhead and buried utilities).

Before raising the mast (derrick), all drill rig personnel and visitors (with exception of the operator) should be cleared from the areas immediately to the rear and the sides of the mast. All drill rig personnel and visitors should be informed that the mast is being raised prior to raising it.

Before the mast (derrick) of a drill rig is raised and drilling is commenced, the drill rig must be first leveled and stabilized with leveling jacks and/or solid cribbing. The drill rig should be releveled if it settles after initial set up. Lower the mast (derrick) only when leveling jacks are down and do not raise the leveling jack pads until the mast (derrick) is lowered completed.

Before starting drilling operations, secure and/or lock the mast (derrick) if required according to the drill manufacturer's recommendations.

The operator of a drill rig should only operate a drill rig from the position of the controls. The operator should shut down the drill engine before leaving the vicinity of the drill rig.

Do not consume alcoholic beverages or other depressants or chemical stimulants prior to starting work on a drill rig or while on the job.

Watch for slippery ground when mounting and dismounting from the platform.

All unattended boreholes must be adequately covered or otherwise protected to prevent drill rig personnel, site visitors or animals from stepping or falling into the hole. All open boreholes should be covered, protected or backfilled adequately and according to local or state regulations on completion of the drilling project.

Horsing around" within the vicinity of the drill rig and tool and supply storage areas is never allowed, even when the drill rig is shut down.

Be careful when lifting heavy objects. Before lifting a relatively heavy object, approach the object by bending at the knees, keeping your back vertical and unarched while obtaining a firm footing. Grasp the object firmly with both hands and stand slowly and squarely while keeping your back vertical and unarched. In other words, perform the lifting with the muscles in your legs, not the muscles in your lower back.

Drilling operations must be terminated during an electrical storm.

The minimum number of personnel necessary to achieve the objectives shall be within 25 feet of the drilling or sampling activity. Back-up personnel should remain at least 25 feet from the drilling or sampling activity, where practical.

Hard hats and steel toe boots are to be worn by all personnel in the vicinity of the drilling activities. Drilling personnel should not wear loose-fitting or bagging clothing which may be awkward or get caught on equipment. Jewelry, including rings and necklaces, must not be worn around electrical wires or rotating equipment.

ATTACHMENT B
SAFETY GUIDELINES FOR TEST EXCAVATIONS

AD89-036B

SAFETY GUIDELINES FOR TEST EXCAVATIONS

This procedure contains general safety requirements for excavating and trenching operations and work performed therein. The requirements are consistent with standards established by the Occupational Safety and Health Administration (OSHA) and described in 29 CFR 1926, Subpart P. Test excavation equipment maintenance and safety is the responsibility of the equipment operator.

Requirements

When planning any excavating operation, obtain a permit, if required, from the proper authority.

Before digging, determine if underground installations, such as sewer, water, fuel, or electrical lines are to be encountered, and if so, determine the exact locations of the lines. Information can be obtained by contacting Underground Service Alert (consult local telephone directory for toll-free number), local utility companies and the owner of the property on which the excavating operations are planned.

Trees, boulders, and other surface encumbrances, located so as to pose a potential hazard to employees must be removed or made safe before the operation begins.

Excavated materials must be placed at least two feet from the edge of the excavation and precautions must be taken to prevent the materials from falling into the excavation.

Shoring and Sloping

Excavations in which personnel are required to work must be shored or sloped to an angle of repose if the depth of the excavation is five (5) feet or more. When a shoring system is used, it shall consist of hydraulic shores or the equivalent, with sheathing or sheet piling as needed. The shoring system must be properly designed and installed to sustain all existing and expected loads. For details on shoring and sloping, consult 29 CFR, Subpart P, Section 1926.650 to 1926.653.

Access

When work is to be performed in an excavation, safe access to the excavation must be provided by means of ladders, stairs, or ramps. Trenches four or more feet deep must have ladders spaced no less than 25 feet apart, and the ladders must extend at least three feet above grade.

Hazardous Atmospheres

At sites where oxygen deficiency or hazardous concentrations of flammable or toxic vapors or gases may be encountered in excavations, the atmosphere in the excavations must be tested by the Site Safety Officer or other qualified person before work in an excavation begins and at appropriate intervals afterward.

Inspection of Excavations

Excavations must be inspected daily by the site manager or site safety officer. If evidence for potential caveins or slides is apparent, all work in the excavation must be suspended until necessary steps have been taken to safeguard employees.

Operation of Vehicles Near Excavations

When vehicles or heavy equipment must operate near an excavation, the sides of the excavation must be shored or braced as necessary to withstand forces exerted by the superimposed load. Stop logs or other types of secure barriers must be installed at the edges of the excavations.

Barricades and Fences

Excavated areas must be completely guarded on all sides with barricades or fences, as appropriate. If barricades are used, they must be spaced no more than 20 feet apart and shall not be less than 35 inches high when erected. A yellow or yellow and black tape, at least 0.75 inches wide, shall be stretched between the barricades.

Backfilling

Excavated areas must be backfilled as soon as practical after work is completed, and all associated equipment must be removed from the area.

ATTACHMENT C
HEAT STRESS PREVENTION GUIDELINES

AD89-036C

HEAT STRESS PREVENTION GUIDELINES

Due to an increase in ambient air temperatures and the effects of protective outer wear decreasing body ventilation, there exists an increase in the potential for injury, specifically, heat casualties. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and the prevention of heat stress casualties.

IDENTIFICATION AND TREATMENT

1) Heat Exhaustion

- a) Symptoms: Usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim is very pale, his skin is clammy, and he may perspire profusely. The pulse is weak and fast, his breathing is shallow. He may faint unless he lies down. This may pass, but sometimes it remains and death could occur.
- b) First Aid: Immediately remove the victim to the Decontamination Zone in a shady or cool area with good air circulation. Remove all protective outer wear. Call a physician. Treat the victim for shock. (Make him lie down, raise his feet 6-12 inches and keep him warm but loosen all clothing.) If the victim is conscious, it may be helpful to give him sips of a salt water solution (1 teaspoon of salt to 1 glass of water). Transport victim to a medical facility as soon as possible.

2) Heat Stroke

- a) Symptoms: This is the most serious of heat casualties due to the fact that the body excessively overheats. Body temperatures often are between 107° - 110°F. First there is often pain in the head, dizziness, nausea, oppression, and the skin is dry, red and hot. Unconsciousness follows quickly and death is imminent if exposure continues. The attack will usually occur suddenly.
- b) First Aid: Immediately evacuate the victim to a cool and shady area in the Decontamination Zone. Remove all protective outer wear and all personal clothing. Lay him on his back with the head and shoulders slightly elevated. It is imperative that the body temperature be lowered immediately. This can be accomplished by applying cold wet towels, ice bags, etc., to the head. Sponge off the bare skin with cool water or rubbing alcohol, if available, or even place him in a tub of cool water. The main objective is to cool him without chilling him. Give no stimulants. Transport the victim to a medical facility as soon as possible.

PREVENTION OF HEAT STRESS

- 1) One of the major causes of heat casualties is the depletion of body fluids. On the site there will be plenty of fluids available. Personnel should replace water and salts loss from sweating. Salts can be replaced by either a 0.1% salt solution, more heavily salted foods, or commercial mixes such as Gatorade. The commercial mixes are advised for personnel on low sodium diets.
- 2) A work schedule should be established so that the majority of the work day will be during the morning hours of the day before ambient air temperature levels reach their highs.

- 3) A work/rest guideline will be implemented for personnel required to wear Level B protection. This guideline is as follows:

<u>Ambient Temperatures</u>	<u>Maximum Wearing Time</u>
Above 90°F	$\frac{1}{2}$ hour
80°-90°F	1 hour
70°-80°F	2 hours
60°-70°F	3 hours
<60°F	4 hours

A sufficient period will be allowed for personnel to "cool down." This may require shifts of workers during operations. No work is to take place under Level B protection in this project without approval by WCC Corporate Health and Safety Officer.

HEAT STRESS MONITORING

For monitoring the body's recuperative ability to excess heat, one or more of the following techniques should be used as a screening mechanism. Monitoring of personnel wearing protective clothing should commence when the ambient temperature is 70 degrees Fahrenheit or above. Frequency of monitoring should increase as the ambient temperature increases or if slow recovery rates are indicated. When temperatures exceed 80 degree Fahrenheit, workers must be monitored for heat stress after every work period.

- Heart rate (HR) should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats per minute. If the HR is higher, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. If the pulse rate is 110 beats per minute at the beginning of the next rest period, the following work cycle should be shortened by 33%.

- Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99 degree Fahrenheit. If it does, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. However, if the OT exceeds 99 degrees Fahrenheit at the beginning of the next period, the following work cycle should be further shortened by 33%. OT should be measured again at the end of the rest period to make sure that it has dropped below 99 degree Fahrenheit.
- Body water loss (BWL) due to sweating should be measured by weighing the worker in the morning and in the evening. The clothing worn should be similar at both weighings; preferably the worker should be nude. The scale should be accurate to plus or minus 1/4 lb. BWL should not exceed 1.5% of the total body weight. If it does, workers should be instructed to increase their daily intake of fluids by the weight lost.

Ideally, body fluids should be maintained at a constant level during the work day. This requires replacement of salt lost in sweat as well.

Good hygienic standards must be maintained by frequent change of clothing and daily showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

ATTACHMENT D
COLD EXPOSURE PREVENTION GUIDELINES

AD89-036D

COLD EXPOSURE PREVENTION GUIDELINES

Person working outdoors in temperatures at or below freezing may be frostbitten. Extreme cold for a short time may cause severe injury to the surface of the body, or result in profound generalized cooling, causing death. Areas of the body which have high surface area-to-volume ratio such as fingers, toes, and ear, are the most susceptible.

EFFECTS OF COLD EXPOSURE

Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10°F with a wind of 15 mile per hour (mph) is equivalent in chilling effect to still air at -18°F.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is perspiration soaked.

Local injury resulting from cold is included in the generic term frostbite. There are severe degrees of damage. Frostbite of the extremities can be categorized into:

- Frost nip or incipient frostbite: characterized by suddenly blanching or whitening of skin.
- Superficial frostbite: skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.

- Deep Frostbite: tissues are cold, pale, and solid; extremely serious injury.

To administer first aid for frostbite, bring the victim indoors and rewarm the areas quickly in water between 30°C and 41°C (102°F-105°F). Give a warm drink - not coffee, tea or alcohol. The victim should not smoke. Keep the frozen parts in warm water or covered with warm clothes for 30 minutes, even though the tissue will be very painful as it thaws. Then elevate the injured area and protect it from injury. Do not allow blisters to be broken. Use sterile, soft, dry material to cover the injured areas. Keep victim warm and get immediate medical care.

After thawing, the victim should try to move the injured areas a little, but no more than can be done alone, without help.

- Do not rub the frostbitten part (this may cause gangrene).
- Do not use ice, snow, gasoline or anything cold on frostbite.
- Do not use heat lamps or hot water bottles to rewarm the part.
- Do not place the part near a hot stove.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature, its symptoms are usually exhibited in five stages; 1) shivering; 2) apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95°F; 3) unconsciousness, glassy stare, slow pulse, and slow respiratory rate; 4) freezing of the extremities; and, finally, 5) death.

As a general rule, field activities should be curtailed if equivalent chill temperature (°F) is below zero unless the activity is of an emergency nature. The ultimate responsibility for proposing or delaying work at a site due to inclement weather rests with the Site Safety Officer.

ATTACHMENT E
TICKS AND TICK-BORNE DISEASES

AD89-036E

TICKS AND TICK-BORNE DISEASES

Field personnel should be aware of an increased occurrence of tick-borne disease in the United States. In the northeast, the most likely carriers are the white-footed mouse and the white-tailed deer. These animals are most prevalent in areas where suburban environments about open fields or woodlands. Although exposure is increased in these areas, other carriers, such as dogs and horses, can be found in a variety of environments.

All field personnel should take proper precautions to limit exposure to ticks and tick-borne diseases. These include:

- Cinching and taping clothing at the ankles and wrists, especially the ankles. Ticks lie low on grass blades and shrubs. They encounter your feet, ankles or lower legs and then crawl upward.
- Wear light-colored clothing to facilitate spotting the ticks, and check your clothing periodically. Be especially careful in terrain with tall grass, bushes or woods.
- Use a tick repellant on skin or clothing. Always read the labels before using. Clothing repellents should never be used on the skin.
- Recognize the signs of a bite or an infection. It takes several hours for a tick to attach and feed; removing it promptly lessens the chance of being infected.

Pregnant women should be particularly careful since the effects of the most common tick-borne disease in the northeast, Lyme disease, upon the fetus is unknown.

If a tick is discovered on the skin, it is important to remove the entire insect as soon as possible. The most effective method is to grasp the tick as close as possible to the mouth with tweezers or thin, curved forceps. Then, without jerking, pull it upward steadily (a small amount of skin may be removed in the process).

After removing the tick, disinfect the bite with rubbing alcohol or povidone iodine (Betadine). Don't handle the tick; spirochetes could enter the body through breaks in the skin. Dispose of it in alcohol or flush it down the drain. And check the bite occasionally for at least two weeks to see if a rash forms. If it does, you've been infected and should seek treatment promptly.

The rash appears at the bite location from two days to a few weeks after the bite. It usually starts as a small red spot that expands as the spirochetes spread beyond the bite. Most commonly, the rash develops into a reddish circle or oval about two to three inches in diameter. It fades with or without treatment after a few weeks.

Much larger rashes - anywhere from 6 to 20 inches in diameters - may also occur, especially on the back. Despite their size, large rashes may be easy to miss because they're often very faint.

Other variants include a rash with a red perimeter and a clear center and the so-called bull's-eye rash, which consists of several concentric red rings. Rashes may vary in shape, depending on where they occur on the body. Frequent sites are the thigh, groin, and armpits. People often develop a rash in more than one place.

Early symptoms may include profound fatigue, a stiff neck, and flu-like symptoms such as headache, chills, fever, and muscle aches. Since tick bites don't always produce a rash, those symptoms alone may warrant a medical check for possible Lyme infection - especially if they occur in summer and you live in an area that is endemic for Lyme disease.

Without treatment, the spirochetes usually multiply and the disease progressively worsens. The second stage, occurring within weeks to months of the bite, may affect the heart and nervous system. Third is the chronic arthritic stage, which begins up to a year or more after the bite.

ATTACHMENT F
INCIDENT REPORT FORM

AD89-036F

Location _____

- Corporate Health and Safety Administrator
- Corporate Health and Safety Officer
- Project Manager
- Personnel Office (medical treatment cases only).

ATTACHMENT G
OSHA INFORMATION POSTER

AD89-036G

JOB SAFETY & HEALTH PROTECTION

The Occupational Safety and Health Act of 1970 provides job safety and health protection for workers by promoting safe and healthful working conditions throughout the Nation. Requirements of the Act include the following:

Employers

All employers must furnish to employees employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious harm to employees. Employers must comply with occupational safety and health standards issued under the Act.

Employees

Employees must comply with all occupational safety and health standards, rules, regulations and orders issued under the Act that apply to their own actions and conduct on the job.

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor has the primary responsibility for administering the Act. OSHA issues occupational safety and health standards, and its Compliance Safety and Health Officers conduct jobsite inspections to help ensure compliance with the Act.

Inspection

The Act requires that a representative of the employer and a representative authorized by the employees be given an opportunity to accompany the OSHA inspector for the purpose of aiding the inspection.

Where there is no authorized employee representative, the OSHA Compliance Officer must consult with a reasonable number of employees concerning safety and health conditions in the workplace.

Complaint

Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace. OSHA will withhold, on request, names of employees complaining.

The Act provides that employees may not be discharged or discriminated against in any way for filing safety and health complaints or for otherwise exercising their rights under the Act.

Employees who believe they have been discriminated against may file a complaint with their nearest OSHA office within 30 days of the alleged discrimination.

Citation

If upon inspection OSHA believes an employer has violated the Act, a citation alleging such violations will be issued to the employer. Each

citation will specify a time period within which the alleged violation must be corrected.

The OSHA citation must be prominently displayed at or near the place of alleged violation for three days, or until it is corrected, whichever is later, to warn employees of dangers that may exist there.

Proposed Penalty

The Act provides for mandatory penalties against employers of up to \$1,000 for each serious violation and for optional penalties of up to \$1,000 for each nonserious violation. Penalties of up to \$1,000 per day may be proposed for failure to correct violations within the proposed time period. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to \$10,000 for each such violation.

Criminal penalties are also provided for in the Act. Any willful violation resulting in death of an employee, upon conviction, is punishable by a fine of not more than \$10,000, or by imprisonment for not more than six months, or by both. Conviction of an employer after a first conviction doubles these maximum penalties.

Voluntary Activity

While providing penalties for violations, the Act also encourages efforts by labor and management, before an OSHA inspection, to reduce workplace hazards voluntarily and to develop and improve safety and health programs in all workplaces and industries. OSHA's Voluntary Protection Programs recognize outstanding efforts of this nature.

Such voluntary action should initially focus on the identification and elimination of hazards that could cause death, injury, or illness to employees and supervisors. There are many public and private organizations that can provide information and assistance in this effort, if requested. Also, your local OSHA office can provide considerable help and advice on solving safety and health problems or can refer you to other sources for help such as training.

Consultation

Free consultative assistance, without citation or penalty, is available to employers, on request, through OSHA supported programs in most State departments of labor or health.

More Information

Additional information and copies of the Act, specific OSHA safety and health standards, and other applicable regulations may be obtained from your employer or from the nearest OSHA Regional Office in the following locations:

Atlanta, Georgia
Boston, Massachusetts
Chicago, Illinois
Dallas, Texas
Denver, Colorado
Kansas City, Missouri
New York, New York
Philadelphia, Pennsylvania
San Francisco, California
Seattle, Washington

Telephone numbers for these offices, and additional area office locations, are listed in the telephone directory under the United States Department of Labor in the United States Government listing.

Washington, D.C.
1985
OSHA 2203



William E. Brock, Secretary of Labor

U.S. Department of Labor
Occupational Safety and Health Administration



ATTACHMENT H
PERSONAL PROTECTIVE EQUIPMENT

AD89-036H

PERSONAL PROTECTIVE EQUIPMENT

Level D Personal Protective Equipment

- Hard hat (if overhead hazard exists)
- Safety glasses or goggles (if splash or dust hazard exists)
- Steel toed and steel shank work boots⁽¹⁾
- Nitrile - butadiene rubber outer gloves⁽¹⁾
- Latex surgical gloves (to be worn underneath outer gloves)⁽¹⁾
- Regular tyvek coveralls⁽¹⁾

(1) Optional, at discretion of SSO or his/her designee.

Modified Level D Personal Protective Equipment

- Hard hat (if overhead hazard exists)
- Safety glasses or goggles (if splash or dust hazard exists)
- Steel toed and steel shank work boots⁽¹⁾
- Nitrile - butadiene rubber outer gloves
- Latex surgical gloves (to be worn underneath outer gloves)
- Saranex impregnated Tyvek coveralls (taped at cuffs)
- Rubber overboots or disposable "booties"

(1) Optional, at discretion of SSO or his/her designee.

Level C Personal Protective Equipment

- Hard hat (if overhead hazard exists)
- Full-face MSA (or equivalent) respirator with appropriate cartridges

- Steel toed and steel shank work boots⁽¹⁾
- Nitrile - butadiene rubber outer gloves
- Latex surgical gloves (to be worn underneath outer gloves)
- Rubber overboots or disposable "booties"
- Saranex impregnated Tyvek coveralls (taped at cuffs)

(1) Optional, at discretion of SSO or his/her designee.

ATTACHMENT I
EMERGENCY TELEPHONE NUMBERS AND DIRECTIONS TO HOSPITAL

AD89-036I

EMERGENCY TELEPHONE NUMBERS AND DIRECTIONS TO HOSPITAL

This list of emergency services must either be posted on-site or carried by field personnel:

<u>Emergency Services</u>	<u>Telephone Number</u>
Ambulance	(401) 781-9200
Cranston Fire Department	(401) 461-5000
Cranston Police Department	(401) 942-2211
Rhode Island Hospital	(401) 277-4000
Poison Control Center	(800) 962-1253
US EPA National Response Center	(800) 438-2427

Directions to Rhode Island Hospital from Site (see attached Figure)

- o Take Mill Street north about 0.3 mi. to Park Avenue.
- o Turn left onto Park Avenue and follow approximately 0.3 mi. to Route 10.
- o Bear right onto Rt. 10 and follow to I-95 (approximately 0.8 miles)
- o Bear right onto the entrance ramp for I-95 northbound. Take I-95 north to exit 18; the first exit after getting on (approximately 1.5 mi).
- o Bear left on the exit as to circle under under I-95. The exit terminates at Eddy St.
- o Turn right on Eddy St. and follow to Rhode Island Hospital (approximately 0.9 mi).

- o Rhode Island Hospital is on the left.

ALL FIELD PERSONNEL MUST BE FAMILIAR WITH THE
ROUTE TO BE FOLLOWED TO THE HOSPITAL IN CASE OF
THE OCCURRENCE OF ANY MEDICAL EMERGENCY.

The directions to the Hospital must be verified by the SSO prior to the initiation of fieldwork.



MAP SOURCE:
 USGS TOPOGRAPHIC
 7.5 MINUTE QUADRANGLE,
 PROVIDENCE, RHODE ISLAND,
 1957 (PHOTOREVISED 1970 AND 1975).

**DIRECTIONS TO RHODE ISLAND HOSPITAL
 FROM THE CIBA-GEIGY FACILITY
 CRANSTON, RHODE ISLAND**

WOODWARD - CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
 WAYNE, NEW JERSEY

DR. BY: KF	SCALE: --	PROJ. NO: 87X4660
CK'D BY: MH	DATE: 18 AUG 1989	FIG. NO: I-1

ATTACHMENT J
EMERGENCY FIRST AID PROCEDURES

AD89-036J

EMERGENCY FIRST AID PROCEDURES

If an employee working in a contaminated area is physically injured, Red Cross first aid procedures must be followed. Depending on the severity of the injury, emergency medical response may be sought. If the employee can be moved, he/she must be taken to the edge of the work area (on a stretcher, if needed) where contaminated clothing will be removed (if possible), emergency first aid administered, and transportation to local emergency medical facility awaited.

If the injury to the worker is chemical in nature (e.g., overexposure), the following first aid procedures must be instituted as soon as possible:

- a. Eye Exposure - If contaminated solid or liquid gets into the eyes, wash eyes immediately at the emergency eyewash stations using large amounts of water and lifting the lower and upper lids occasionally. Obtain medical attention immediately. (Contact lenses are not permitted in the Exclusion Zone.)
- b. Skin Exposure - If contaminated solid or liquid gets on the skin, promptly wash contaminated skin using soap or mild detergent and water. If solids or liquid penetrate through the clothing, remove the clothing immediately and wash the skin using soap or mild detergent and water. Obtain medical attention immediately if symptoms warrant.
- c. Breathing - If a person breathes in large amounts of organic vapor, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Obtain medical attention as soon as possible.
- d. Swallowing - If contaminated solid or liquid has been swallowed and the person is conscious, feed the person large quantities of salt water

immediately and induce vomiting (unless the person is unconscious).
Obtain medical attention immediately.

First Aid Procedures

- o Remove the injured or exposed person(s) from immediate danger.
- o Render first aid if necessary, and decontaminate affected personnel, if necessary.
- o Call an ambulance for transport to local hospital immediately. This procedure should be followed even if there is no apparent serious injury. Emergency numbers are listed in Attachment I.
- o Evacuate other personnel on-site to a safe place until the SSO determines that it is safe for work to resume.
- o Report the accident to the HSO immediately.